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THE TRANSACTIONS OF

THE SOCIETY OF ALUMNI OF BELLEVUE HOSPITAL

FOR 1896-'97

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SOCIETY OF

ALUMNI OF BELLEVUE HOSPITAL.

Meeting of October 7, 1896.

The President, Dr. Lucius W. Hotchkiss, in the Chair.

The President's Inaugural Address.—Dr. Hotchkiss expressed his sincere appreciation of the great honor conferred in electing him president of this most honorable society. For this mark of confidence and esteem, the highest gift in the power of the society to grant, he expressed his sincerest thanks.

In accepting the honored position of president of this society, he said, and fully impressed with its dignity and responsibility, he was also conscious of the great amount of work which its acceptance entailed. The officers of the society were its servants, and much depended upon their faithful discharge of duty. He was proud, moreover, to have associated with him as vice president one who honored the office, and who had done so much to further the best interests and traditions of the organization.

In assuming the chair and recalling how much has been accomplished by the energetic officers of former years, Dr. Hotchkiss said that he could not but feel his own unworthiness, and should many times have to ask indulgence, and should always rely on hearty co-operation in furthering the progress of the good work begun.

It was his good fortune, he said, to have been identified with the Society of Alumni of Bellevue Hospital from its birth; to have been one of the committee on organization which reported September 21, 1886, a constitution and by-laws which were adopted.

He had watched with the greatest joy and pride

its progress from a lusty infancy to a promising youth, and felt justly proud of his membership in such an organization. Looking backward over the first decade of its history, he was amazed by the steady and marvelous growth from small beginnings.

Organized for the object of promoting the advancement of medicine and surgery and social intercourse among its members, it had singularly prospered. Its influence was felt among alumni of Bellevue everywhere.

The great reunions which had occurred from time to time had been the means of bringing together old Bellevue men from different parts of the world, of fostering good fellowship and heightening the *esprit de corps* among the many children who claimed old Bellevue as their Alma Mater. From an original membership of nineteen which had by the end of the first year reached forty-one, the roll had increased rapidly until in 1894 it numbered one hundred and ninety-nine members. At the present date there were two hundred and twenty-three, which number included resident, nonresident, associate and permanent associate, and honorary members. The early meetings in the winter of 1886 were held in Carnegie Laboratory, where, in the midst of dusty collections of various pathological specimens and growing potato cultures of the cholera bacillus, and enlivened and sustained by the presence of a small keg of beer and a plate of sandwiches, the members passed long evenings in which science, sandwiches, and smoke were joyously mixed.

At this time, though the membership was limited to graduates of not longer than ten years' standing, they rejoiced in their name of The Society of *the* Alumni of Bellevue Hospital.

As the membership rapidly enlarged the society sought better quarters, until, at the great gathering at the Cambridge, some six years ago, it began like a young giant to appreciate its great strength and marvelous growth. From that time its growth had been healthy and steady; and the meetings had been full of interest.

A few years ago, continued Dr. Hotchkiss, a medical journal had sharply criticised the society for styling itself The Society of Alumni, etc. The researches of one of its most honored and learned members, however, had clearly proved that etymologically, at least, the society's name was correct, for, as he skillfully pointed out, the members were all alumni—*i. e.*, nourished by a common mother. He pointed out that the word alumnus

was derived from *alere*—to feed, to nourish. And were they not fed, if not nourished, forsooth, by their Alma Mater? And having been so fed, they all felt that they represented the survival of the fittest, The Society of Alumni of Bellevue Hospital.

They looked backward upon the first decade of their history to the struggles of their young society, and its progress by rapid strides to the foremost position among the great clinical societies of the great city. They were all proud of her. Standing on the threshold of a new year, said Dr. Hotchkiss, and looking back on a glorious past, they should press forward earnestly to the attainment of a greater growth and usefulness. In Dr. Carlisle's account of Bellevue Hospital, published in 1893, was a list of 427 alumni of Bellevue then living and practising. Of this number, 210 lived in New York city, 56 lived in the State, and 161 were scattered in other States and countries. The speaker thought that every effort should be made to increase their numbers. The objects of the society appealed to every worthy son of Bellevue. Every Bellevue man should be interested in the work and every one who was worthy should be upon the rolls.

The tendency of all medical societies was to become, after a time, more or less apathetic, to leave the active work to a few. Here it should not be so. The members were all interested, and should all be workers.

The society wanted the young men and the old men.

The floor was open to all, and the younger men fresh from the work of the wards should be encouraged to use it.

With all workers and no drones in the hive, with all doing active service in the welfare of the society, it would easily accomplish a much greater work in the future than in the past, not only in the way of encouraging social intercourse and good fellowship among men who seldom met, but in the advancement of medicine and surgery, and by adding its share to the great source of human knowledge.

Paper.

A FOURTH CASE OF RUPTURED ECTOPIC-GESTATION SAC.

By A. BROTHERS, B. S., M. D.

A YOUNG woman of about thirty years of age, separated some three years from her husband, had been brought to Beth Israel Hospital the morning of October 7th with the diagnosis (made at her home by Dr. B. Gordon and Dr. I. Barsky) of ectopic gestation. Excepting a history of eight weeks' menstrual cessation, followed by irregular menstrual flow during several weeks, nothing definite could be made out. Four weeks ago she had applied at a large hospital uptown, but had been refused admission. She had then spent several weeks in one of the city hospitals situated in the lower portion of the city, but had been discharged unimproved. I saw her at the time of admission, at 11.30 A. M. Her features were anxious and drawn, her lips excessively pale, and she was moaning with pain referred to the abdomen. The temperature was 98° F.; pulse 80, and of fair volume. The abdomen was distinctly distended. Over both lateral regions, and anteriorly halfway up to the umbilicus, the percussion note was flat. *Per vaginam*, the cervix was found pushed anteriorly against the symphysis pubis by a liquid exudate, which clearly gave a sense of fluctuation. Later the sound proved the uterine cavity to be empty and increased in depth by an inch or more.

The probable diagnosis of freshly ruptured extra-uterine-gestation sac was made, and the patient sent up to the operating room. In a half hour all preparations had been completed, and with the valuable assistance of Dr. B. Gordon, Dr. L. J. Ladinski, and the house staff, I proceeded with the operation.

On opening the abdomen, a large quantity of dark-colored blood with clots made its escape, showing that rupture had taken place some time previously. On introducing the hand the right tube was found to be the seat of a tumor of nearly the size of a small orange. This, with the corresponding and attached ovary, was quickly brought out of the incision and removed in the usual manner. A large rupture was visible, but there was no evidence of a fœtus. The abdominal cavity was next explored and the free blood mopped out, and the clots were removed. There must have been over a

quart of blood present. After considerable difficulty a fœtus of about four months' growth was found in the left side of the pelvis buried among clots. On its removal there was a persistent oozing of blood from the general peritoneal cavity. This was found to be fresh hæmorrhage and was traced to a spot bounded behind by the spine, in front by the omentum, above by intestine, and below by the affected tube. This had evidently been the site of the placental attachment of the abdominal pregnancy which had formed after the tube had ruptured. In other words, the ectopic sac, originally tubal, had ruptured, and had become converted into an abdominal one. On tamponing with iodoformized gauze strips all hæmorrhage was controlled. The patient was then given a subcutaneous salt infusion, and some of the same solution was freely used in the peritoneal cavity to wash out clots. The time occupied by the operation was nearly an hour. At its end the patient's condition was quite fair, the pulse ranging between 120 and 130. Five hours later, when I again saw the patient, her condition was fairly satisfactory. The pulse was still about 130, but of good volume. There had been no vomiting, and pain was only moderate.

The specimens showed a fœtus about four inches in length, a placenta, an umbilical cord, and the ruptured tubal sac with its corresponding adherent ovary.

NOTE.—The patient was discharged, cured, several weeks later. The wound was closed in great part with secondary sutures five days after the operation. A mild pneumonia caused a febrile movement for about a week.

Paper.

1. SOME UNUSUAL CASES OF INFLAMMATION OF THE APPENDIX VERMIFORMIS. 2. THREE CASES OF SUPRAPUBIC HYSTERECTOMY.

By CHARLES CLIFFORD BARROWS, M. D.

I WILL ask your attention to the reports of eight cases, with specimens, selected from my work during the summer months, since we last met. I have selected these because each presents something of interest out of the usual run of cases of similar general character. There are four cases in which the appendix vermiformis has been removed, two in which inflammation of this or-

gan complicated ovarian cysts—one that of ectopic gestation and one that of uterine fibroids and pelvic abscess.

There are two other cases of ectopic gestation, one other case of hysterectomy for uterine fibroids and intraligamentous cyst, and one hysterectomy for septic uterus and appendages. Some of the specimens are of unusual interest, as you will see:

Case I.—E. M., aged twenty-nine years; a native of New York, a widow, and by occupation saleswoman; was referred to me by Dr. Hamlen on August 24, 1896. Her history shows that she began to menstruate at fifteen years of age, and has been regular until four months ago. Since that time her menstruation has been profuse, lasting a week at each period. She has also had leucorrhœa, and has been obliged to take three douches daily to keep herself free from the irritating effects of this discharge. She has had one child, eleven years ago. Examination of the urine shows it to be normal in reaction, with three per cent. urea; no albumin nor casts. She has had the ordinary diseases of childhood, and denies alcoholic and venereal history.

Her present illness began four months ago with severe pain in the suprapubic region, frequent and painful micturition, and profuse painful menstruation, recurring every two weeks, followed in the interval by severe leucorrhœal discharge. Examination reveals a uterus normal in size, deflected to the left of the median line by a tumor the size of a small orange situated in the region of the right ovary. On opening the abdomen by the median incision a small ovarian cyst the size of an orange was found on the right side. Adherent to the posterior aspect of the cyst was an elongated appendix vermiformis, inflamed and thickened, and bent upon itself. The cyst was removed, its pedicle being ligated with silk. The appendix was then tied off with catgut close to the cæcum and removed, the stump being touched with pure carbolic acid. The abdomen was closed without drainage with the figure-of-eight silkworm-gut suture.

The patient has made a satisfactory convalescence and is now well.

Case II.—Miss D., a trained nurse, was referred to me on July 6th by Dr. Gardner, with the following history: She is unmarried, and has always been well until

six weeks prior to admission, when she began to suffer from severe pelvic pain, together with frequent painful micturition and severe pain on defecation. She was much relieved during menstruation, but on the cessation of the flow the symptoms reappeared. She has been confined to bed for two weeks, and during the last five days has had fever, with daily chills and severe sweats. She suffers constantly from nausea, and vomits everything taken into the stomach.

When seen by me, the patient's temperature was 102.8° F.; pulse, 128, small and wiry; and respiration, 30. Her abdomen was greatly distended, tympanitic, and exquisitely tender to the touch.

Examination by the vagina revealed a uterus fixed in the pelvis by a mass of inflammatory material on each side and behind. The abdomen was so distended that nothing unusual in the region of the cæcum could be discovered.

The abdomen was opened by the median incision, and the peritonæum found to be generally acutely inflamed. The origin of the trouble was found to be a suppurating ovarian cyst of the right side, to which was adherent an acutely inflamed appendix vermiformis. The cyst and appendix were removed, the peritonæum was cleansed as far as possible of serum and lymph, and a Mikulicz gauze drain was introduced through the abdominal incision to the bottom of the pelvis. The wound in its upper two thirds was closed with silkworm-gut sutures. The gauze was removed on the eighth day after the operation. The patient rallied slowly, and for several days was desperately ill, but ultimately made a good recovery, and is now entirely well.

Case III.—The patient, a widow of forty-three, was referred to me by Dr. C. C. Knight, of Peekskill, with the following history: Four years ago she had removed from her uterus, by a surgeon of this city, a small fibroid polypus. She did not recover from this minor operation as she should, but developed in the course of the next month an accumulation of pus in the left side of the pelvis. This was opened by an incision along the line of Poupart's ligament on the left side, and also into the vagina in Douglas's pouch. She improved slowly, and at the end of four months she returned to Peekskill, where she has been able for the past four years to follow her occupation, that of obstetrical nursing. Her occupation has, however, been constantly interfered with by repeated attacks of peritoneal inflammation, coming

on usually at the menstrual periods, which have been very profuse and exhausting in character.

I saw her first on September 10th with Dr. Knight, of Peekskill.

She was just completing a profuse menstruation of two weeks' duration, and was confined to bed, with temperature 102° F., and pulse 110 to 120. She had some nausea and vomiting, frequent chilliness and sweats, and presented the general aspects of mild sepsis. She complained of much pain in her pelvic region, and especially in the right iliac fossa.

Physical examination revealed the presence of a firm, hard, non-fluctuating tumor, filling the whole pelvis, and immovable—apparently a uterine fibroma. Protruding from the cervix uteri was a small polyp, submucous in character. This tumor could be outlined above the pubes, and reached halfway up to the umbilicus. In addition to this apparent fibroid tumor there was a tense fluctuating tumor as large as a small cocoanut, reaching to the level of the umbilicus in the right iliac fossa. On pressure from above this was found to communicate with a point of fluctuation behind the cervix uteri in the vagina. This tumor was slightly movable, though to a very limited degree.

Dr. Knight informed me that this tumor always increased in size very markedly about the menstrual period and then gradually decreased until, at the intermenstrual period, it was scarcely perceptible on palpation. There was never at any time any discharge of pus from the vagina or rectum.

A week after I saw the patient at Peekskill Dr. Knight sent her to me here for operation. When she arrived her temperature was 99.6° F., and her pulse 110. The pelvic tumor was as described above, but the fluctuating mass had almost disappeared, being apparently of about the size of a hen's egg.

On the following day, September 18th, I opened the abdomen in the median line. The pelvic cavity was filled by a nodular fibroid uterus to the right, and above which there was a flaccid tumor about as large as a walnut, with a process dipping down into the pelvis behind and adherent to the uterus. These tumors were covered by coils of intestine united to them by the firmest adhesions I have ever encountered. Attached to the flaccid sac was the appendix vermiformis, the two being united by old, firm adhesions.

It was with great difficulty that I succeeded in separating the adherent intestines. I then tied off the

appendix vermiformis with catgut, touching the stump with pure carbolic acid, as is my custom. After tying the tubal and ovarian vessels on the top of the broad ligament, I found it impossible to lift up the fibroid uterus sufficiently to reach the uterine vessels, since the tumor was so firmly fixed in the pelvis. I then approached it by the vaginal route, clamping the uterine vessels and freeing the tumor. It was then drawn out without great difficulty. A Mikulicz gauze packing was placed in the pelvis and vagina and the abdominal wound closed with the figure-of-eight silkworm-gut suture. As the operation had been a tedious one, and the patient was suffering somewhat from shock, an intracellular saline injection was given. The patient has had a satisfactory convalescence and is now well. Examination of the tumor shows a hard, nodular fibroid of the uterus and a pus sac with very thick walls adherent to and communicating with the lumen of the appendix. It was then evident that this was the route through which the pus had escaped at the times when the pus sac collapsed. I believe that the reason this occurred at the menstrual period was because the uterine tumor, being congested, was lifted higher in the pelvis; the appendix was thus relaxed, and the pus escaped through it into the colon. This pus, in traveling the length of the colon, was so mingled with fæcal matter as not to excite notice when voided.

These cases of appendicular inflammation, complicating and masked by disease of the pelvic organs, are extremely interesting, and it seems to me that the report of such cases just now is very timely. You are all, I take it, familiar with the brilliant results that gynæcologists have been having with operations upon the pelvic organs by the vaginal route.

This method appeals to all of us, and more particularly does it appeal to our patients. Many patients will submit to a colpotomy who will not permit a laparotomy. In this way we may possibly be tempted to adopt this route when it would be best to adhere to the older operation by the median suprapubic incision. These cases serve well to emphasize this note of warning, for in none of these cases would it have been wise or safe to approach the site of trouble by the vaginal route.

Case IV.—The patient, a maiden lady of fifty-six, was referred to me by Dr. Brown, of West Virginia. The patient had always enjoyed good health. Four years ago she had passed the menopause without trouble of any kind. In May last she noticed a swelling in the suprapubic region. There was no pain or tenderness connected with it, and she paid little attention to it. Soon, however, she realized that it was becoming larger, and consulted Dr. Brown, who advised her to come to New York for its removal.

Physical examination revealed a nodular tumor as large as a human head occupying the median line and freely movable.

On September 17th I opened the abdomen by the median incision. There then appeared two tumors adherent to each other—one a nodular uterine fibroid, the other an intraligamentous cyst, each the size of a child's head. Tying off the upper part of the broad ligaments with silk sutures, I enucleated the cyst and removed the uterus with cervix entire, as is seen in the specimen I show you. There were but four ligatures required, one for each of the uterine and ovarian vessels. The cut edges of the vagina were turned in, and the peritonæum closed over it, the abdomen being closed without drainage. The patient's temperature was never above 99° F., and she is now entirely well.

Case V.—The patient, an actress, twenty-six years old, married, was referred to me by Dr. Nary on September 8th. Her family and previous history is unimportant.

Her present illness began seven weeks ago with severe cramplike pains over the lower portion of the abdomen. This was increased on micturition and defecation. During the week prior to admission the bowels had been constipated, the patient has vomited frequently, and the abdomen has become greatly distended. She has had frequent chills and profuse sweats. Temperature, 103°; pulse, 110, small and thready; respiration, 28. Physical examination shows the abdomen much distended and tender to the touch; the uterus is somewhat enlarged and immovable, and the pelvic cavity is filled by a mass, boggy and tender to touch. As the patient was evidently suffering from septic peritonitis I operated at once, at seven o'clock in the evening. On opening the abdomen by the median incision there were found numbers of small collections of flocculent serum here and there in the peritoneal cavity, encysted by intestinal adhesions. These varied from the size of an egg to that of an orange. Their contents were evacuated and the adhesions were

broken down. The tubes and ovaries were the site of purulent accumulations, the right tube containing four ounces and the left two ounces of pus. All the tissues were extremely soft, and ligatures were seated with difficulty. Working as rapidly as possible, because of the condition of the patient, I removed the annexa together with the uterus entire. A Mikulicz gauze drain was carried through the opening in the vagina and the abdominal wound closed with silkworm gut as usual. The operation consumed twenty minutes. The patient made an excellent recovery, and was discharged cured October 1st.

Case VI.—The patient, thirty-four years old, a native of Ireland, married, was sent to Ward 23, Bellevue Hospital, by Dr. Carter on August 10, 1896.

She has been married eleven years and has never had children—having miscarried once at four months. She has had the ordinary diseases of childhood, but otherwise has always been well. Gives a good family and personal history, with the exception that she takes whisky every morning and two or three pints of beer each day. Denies venereal history. Urine: specific gravity, 1.010; urea, one and a quarter per cent.; no albumin; microscopical examination negative. Her present illness began about one month prior to admission, when she was seized with violent pain in the lower part of the back and abdomen, accompanied by nausea and vomiting. This was accompanied by a bloody vaginal discharge, which continued up to date of admission. Has suffered daily from nausea and vomiting since the illness began. Physical examination shows the uterus normally situated, but somewhat enlarged. Behind it and to the right is a boggy mass filling the lateral and posterior fossæ.

The abdomen was opened by the usual median incision. A large hæmatoma, shut in by adhesions and filling the space to the right and behind the uterus, was then encountered. The origin of the blood was found to be a ruptured tubal pregnancy, the break in the tube being about the middle third. The left ovary and tube were practically destroyed by inflammation. Caught in the inflammatory mass on the right side was the appendix vermiformis which had undergone parenchymatous inflammation. This was tied off, as in the other cases reported, and the hæmatoma together with the uterus and annexa removed complete to the vagina. Vaginal gauze drainage was established and the ab-

dominal wound closed. The patient made an uninterrupted recovery; was discharged September 24th, well.

I have reported the cases of appendicular inflammation because they have all been encountered in operations for other grave conditions, and have not been considered as the primary reason for making the operation.

We not uncommonly find the appendix inflamed and adherent in inflammatory conditions of the pelvic organs. Indeed, it is my custom always to examine this structure whenever I open the abdomen for any cause, but I have never before seen such a case as the second one reported to you, where the pus was discharged from a pelvic abscess through the appendix. Again, the combination of ectopic gestation and appendicitis is new to me.

In addition to the cases requiring hysterectomy together with appendectomy, I desire to report two other cases of ectopic gestation occurring in my practice during the summer, one of them demanding hysterectomy, the other a less formidable operation, for their relief:

Case VII.—M. O., married, thirty-one years old, came under my care June 30th, with the following history: The patient has had five children by natural labors, the last eight months ago. She has been well, with normal menstruation, until six weeks prior to admission, when she "took cold" during menstruation. The flow was checked and she was seized with severe cramplike pains in the lower abdomen. During the past six weeks she has had repeated attacks of violent colicky pains in the abdomen, accompanied by profuse bloody discharge from the vagina. Two weeks prior to admission she had a very severe attack, accompanied by faintness and vomiting. She rallied in the course of twenty-four hours, but has continued to suffer from abdominal pain and weakness. Vaginal examination shows a uterus of twice its normal size, surrounded by a soft, boggy tumor filling the posterior and lateral fossæ.

When the abdomen was opened by a median incision the cavity was found to contain large quantities of coagulated blood. This being removed, the right Fallopian tube and ovary were found to be the site of destructive inflammation. The left tube was distended and ruptured at the junction of the inner with the middle

third. The ovaries, tubes, and uterus were removed, and the vaginal and abdominal wounds closed without drainage. The patient made an uninterrupted recovery, and on August 3d was discharged, cured.

Case VIII.—L. D., married, thirty-four years old, was referred to me by Dr. Carter.

The patient has been married eleven years, but has never had children. She has been well and regular in her menstruation until six weeks prior to admission, when she missed her period. Two weeks after this she was seized with severe pain of a paroxysmal character in her abdomen and back, accompanied with nausea and vomiting. Three weeks prior to admission there appeared a bloody vaginal discharge, together with decided increase in the abdominal pain. The patient has been up and about, but has been unable to do any work for the past month.

Vaginal examination shows an enlarged uterine body, and to the right and behind the uterus a tense, semifluctuating tumor as large as a child's head.

The abdomen was opened in the median line and the tumor found to be a hæmatoma in the folds of the broad ligament, due to a rupture of a tubal gestation. The tube was tied off and removed with the clotted blood. The pelvis was sponged dry and the abdomen closed.

The patient made an excellent recovery, and was discharged on September 24th, cured.

All of the cases characterized as tubal pregnancy were examined microscopically, and the diagnosis was confirmed in this way, although in none of them was a fœtus found. Rupture had occurred prior to six weeks' gestation.

Dr. J. W. S. Gouley said, regarding the case of tubal pregnancy, that it was not necessary that any part of the fœtal remains should be found. It was very common on the death of the embryo for it to be destroyed and dissolved. There were other evidences of pregnancy besides the finding of the embryo.

Dr. Robert T. Morris said, regarding the case in which pus had emptied through the appendix into a pelvic abscess, that it called to mind the early observations of Albers. He had explained the perforations that he had found in appendices on post-mortem examinations by supposing that the pus had found its way through the appendix into the bowel. Dr. Morris said

that he believed, with Dr. Barrows, that where there was distinct evidence of infection of the appendix, with destructive involvement of the various structures, it was the wiser plan to remove the appendix. When, however, he found a simple hypertrophy, or an appendix involved in adhesions, and, perhaps, tense with interstitial serous exudate, he opposed the removal of the appendix. He took the position that the appendix should not be removed unless there was evidence of distinct infection of this organ, for the reason that there was always at least slight danger in making the opening into the bowel. Some years ago there had been a number of sharp arguments regarding the advisability of operating in the interval between the attacks of perityphlitis, and he had taken the ground that we should operate in all cases in the interval unless there was some very decided contraindication. At that time his attention had been directed to two well-known cases in which the patients had died after such operations, and where there had been every prospect of a good recovery. Post-mortem examination in these cases had revealed a perforation at the site of the ligation of the stump. He had accordingly made a study of this subject, and had learned that the stump of the appendix could not be ligated like an artery, because on the proximal side there was septic fluid—the contents of the cæcum. On the other side there was often septic fluid also. The ligature produced compression anæmia at that point, and the part subjected to such anæmia was unable to withstand the attacks of bacteria because the so-called phagocytes were unable, owing to the obstructed circulation, to cope with the bacteria. In an artery there was on one side an aseptic fluid—the blood serum—which was destructive to the bacteria, and on the other side the region of compression anæmia was pretty well protected against bacterial invasion. For these reasons he believed the method of inverting the stump of the appendix should be employed in cases of removal of the appendix, wherever this was possible. Several methods of this kind had been introduced, and had been quite successful in practice. In the cases in which it was impossible to invert the stump or employ the Lembert suture, he thought it wise to bring the cæcum to the surface and suture it to the external wound in the muscles, so that if bacteria should invade any region subjected to compression anæmia the cæcal contents would escape externally. Where we could

neither bury the stump nor bring the cæcum to the surface we should endeavor to wall off the tract with aristol or anything which would give a lymph coagulum in the vicinity. We should then employ some small drainage device—something small enough to avoid shock. He considered this matter of the treatment of the stump one of the most important details in the entire subject of the treatment of the infected appendix.

Dr. A. Brothers said, regarding extra-uterine pregnancy, that he had seen four cases, in which one patient had been treated without operation, and the other three surgically. The one treated without operation had probably been the subject of an early extra-uterine pregnancy of the tubal or interstitial variety. Death of the ovum had been accomplished and absorption hastened in this instance by the use of electricity. In the second case—also tubal pregnancy—the ectopic gestation sac had been ruptured, and the ovum had escaped into the general peritoneal cavity. This case he had reported to the society last year, and had called attention to the fact that although the abdominal cavity had been full of blood, there had been nothing in the pulse to indicate this condition. The third case had also been one of early ectopic gestation which had ruptured into the fold of the broad ligament. In this case he had operated through the vagina, cleaning out the clots, and draining. The patient at the present time was still under treatment, but was making good progress toward recovery. All the patients had done well. The speaker asked Dr. Barrows if he did not consider it advisable, in cases of hæmatocele due to hæmorrhage in the folds of the broad ligament, to leave the case alone, or else operate through the vagina.

Dr. Barrows said that he had avoided dwelling too much on the technics of the operation for the removal of the appendix vermiformis because he did not wish to lead the discussion away from the principal point at issue—namely, the route of approach in intrapelvic work. Some two years ago the wonderful results obtained by Péan and others had encouraged him to follow the vaginal route. After a very extensive experience with this method he was now of the opinion that it had not the advantages it had been first supposed to possess. It was frequently impossible for the operator to foresee or meet successfully the complications that might arise in these cases when approached by the vagina; hence, unless absolutely certain regarding the

diagnosis, he would continue to approach in these cases by the abdominal route, as heretofore. He predicted that this would be the position taken by many other operators in the near future.

In answer to the question asked by Dr. Brothers, he said that if he felt sure that hæmorrhage occurred in the broad ligament only, he would leave it alone; but it was difficult to say if hæmorrhage ceased and really occupied this situation. He had more than once seen at operation a hæmorrhage held in abeyance for a time by peritoneal adhesions; in all probability if operation was delayed a short time the adhesions would rupture, and the hæmorrhage would return.

Gaseous Distention of the Gall Bladder.—Dr. W. J. Chandler, of South Orange, N. J., related the following history of a case:

Joseph Fratili, an Italian, aged forty-seven years, had been admitted to Orange Memorial Hospital at 8.30 P. M., Sunday, September 27, 1896.

The patient could speak but little English and had no friends. His previous history was therefore rather imperfect. As nearly as could be made out, he had been perfectly well up to noon of Friday, September 25th, when he had been taken with violent pain in the abdomen. The pain had continued, and had been accompanied by frequent vomiting during the next forty-eight hours. On admission, his temperature had been 101° F.; there had been great tenderness in the right lumbar and umbilical regions; the face was anxious; nausea and vomiting were present, the ejected matter being a greenish fluid. The abdomen was distended, but there was no fluctuation, no tumefaction, or any decided dullness in the right lumbar region. High enemata and hot poultices had been ordered. On Monday, September 28th, at 10 A. M., the pulse was 88, respiration 28, and temperature 99.8°. There were the same general symptoms, but no fæcal matter in the discharges. He was ordered ten grains of calomel, and the poultices and enemata were continued.

At 6 P. M. the temperature was normal; the pulse 88, and respiration 28. He slept the greater part of the afternoon. There had been at this time decided swelling and dullness just below the free border of the ribs, on the right side, near the median line. The tenderness here was greater than elsewhere.

At 11 P. M. some flakes of fæcal matter were found in the discharged enemata.

At 10 A. M. Tuesday, September 29th, there was occasional hiccough, and the vomiting and pain still continued. No movement had been produced by the calomel.

At 3.30 P. M. an exploratory laparotomy had been done. The ascending colon had been constricted in its middle third by thick deposits of lymph in the omentum, which had been firmly bound to the large intestine and to the posterior and lateral abdominal walls. The small intestines had been distended with gas and congested. No intussusception had been observed. The gall bladder had been greatly distended and adherent to the transverse colon. No calculus could be felt in the cystic or common duct.

The constricting bands of omentum had been ligated and divided, thus apparently relieving the obstruction. But the patient's condition at this point had become so alarming that it had been decided not to interfere with the distended gall bladder. The operation had been speedily terminated and the patient put to bed. As the influence of the anæsthetic had passed off he had become very restless and insisted on getting up. At times he had been violent and attempted to bite the attendants. It had finally been necessary to tie him in bed.

The radial pulse had ceased before the operation had been finished, and had scarcely been perceptible at any time afterward.

At 6 A. M. on Wednesday, September 30th, he had had a severe chill, and died an hour later. The autopsy had been made six hours after death. On opening the abdomen, almost the first thing that had presented itself had been an intussusception of the small intestine. There had been no special constriction, congestion, or evidence of strangulation about it, and it had been so loosely telescoped that it had fallen apart when it had been removed, although great care had been used to prevent this occurrence. The ascending colon had been somewhat narrowed in its middle third, and had been held down by deposits of lymph. It had been, however, pervious to air and fluids. The kidneys and spleen had been normal except for intense congestion. The gall bladder had been removed with the liver. It had been very tense and had had an apparent capacity of half a pint. It had been punctured, but instead of a gush of fluid there had been only a puff of gas. There had not been more than a tablespoonful of a thick, brownish-yellow bile, the distention having

been mainly gaseous. When the gall bladder had been opened and washed off, spots of ulceration had been found. The duct had been swollen and closed. No calculus had been found.

The PRESIDENT asked if there had been any foul odor about the gall bladder, indicating gangrene.

Dr. CHANDLER replied in the negative. The appearance of the wall of the gall bladder, he said, had been of post-mortem origin.

Dr. E. LE FEVRE said that two years ago he had read of a case in which death had been caused by rupture of the gall bladder, yet no bile had been found. The history had been similar to the one just presented. The reporter of that case had referred to the fact that gaseous distention of the gall bladder and its relation to ordinary biliary colic had been previously discussed. The conclusion had been that these cases had been due to the action of bacteria which had reached the gall bladder from the common duct, and had there acted upon the mucus which had been poured out after their entrance. Marsh gas and hydrogen were said to have been produced as a result of this action of the bacteria. A similar action had been observed in the intestine in the presence of the same bacteria. In the same article it had also been stated that no reason had been found for the fact that these same micro-organisms would produce alcoholic fermentation in the stomach, an odorless gas in the intestine, and yet be present in the gall bladder without such a result. It was probable that there had been a secondary change in the bile ducts and in the mucus.

Foreign Bodies in the Bladder.—Dr. GOULEY presented two specimens of foreign bodies which had been removed from the bladder by way of the urethra. The first had been a cylinder, a quarter of an inch in diameter and three inches in length, punched out of a raw white potato by pressing it against the sharpened nozzle of a tin funnel. The patient, C. J., aged twenty-six years, had used this cylinder as an aid to masturbation and had allowed it to slip into the bladder, on the 3d of August, 1896, three days prior to its extraction, when it had already caused some vesical irritation, as evinced by unduly frequent micturition and the presence of pus in the urine. The extraction of this foreign body had been effected in two minutes by the use of a sort of catheter forceps, devised by Heurteloup, for the removal of calculous fragments after lithotrity.

With this forceps, which had been the only available instrument at hand, the potato cylinder had been caught at one of its extremities and just enough pressure had been applied to the soft structure to hold it without crushing and severing the part seized from the rest of the cylinder, which had been coiled, as seen in the vessel in which it is preserved, and coated with slimy pus and phosphatic crystals. There had been no hæmorrhage and no untoward outcome. The beginning cystitis had aborted and the patient had been dismissed with injunctions to mend his ways. Many different and wonderful substances had made their way into the human bladder, but this bit of potato appeared to be the most novel device of a degraded mind for the gratification of perverted desires.

The second specimen had been a fragment of an India-rubber catheter three inches long, which had been removed, also by way of the urethra, from a patient sixty-five years of age who had been in the habit of catheterizing himself on account of prostatic obstruction to urination. After having withdrawn the catheter at ten o'clock in the morning of September 8, 1896, he had missed several inches of the instrument and had become conscious of its fracture in the bladder. At that time he had been in a suburban place and had sent for a physician who had advised a cutting operation for the removal of the foreign body. Dreading such an operation, he had telephoned to his family physician, Dr. Robert A. Murray, who had condemned the proposed operation, and summoned the sufferer to town, where he had called on Dr. Gouley at three o'clock in the afternoon. The fragment of catheter had been removed in a minute and a half by means of an instrument of small calibre originally devised by Dr. Mercier for the extraction of calculous fragments from the bladder. Not a drop of blood had flowed, and no vesical irritation had ensued.

Dr. Gouley exhibited a number of instruments that had been devised for the purpose of removing catheters and similar foreign bodies from the bladder.

Meeting of November 4, 1896.

The President, Dr. Lucius W. Hotchkiss, in the Chair.

Extirpation of the Tongue for Epithelioma, by Kocher's Method.—Dr. A. B. Johnson presented a man, forty-two years of age, a laborer, who had been admitted to the Roosevelt Hospital on October 5, 1896. The family history had been negative, and there had been no history of syphilis or tuberculosis. He had been a hard drinker, and had smoked a pipe a good deal. One year ago, a small papule had appeared on the right border of the tongue, midway between the base and the tip. After a time the patient had begun to suffer from darting pains in the growth. Five months ago chewing and speaking had become painful, and since then the pain and discomfort had increased rapidly in severity. On admission to the hospital he had been found to be fairly nourished, but his circulation had been poor. His tongue had been coated, and there had been many carious teeth. On the right side of the tongue had been a hard growth extending from the base of the tongue well forward toward the tip. It had been elevated a fourth of an inch above the level of the tongue, and on a portion of its surface had been a shallow ulcer, covered with a thin slough. The growth had crossed the median line near the base of the tongue, and to some extent had involved the floor of the mouth, the right anterior pillar of the fauces, and the tonsil. The movements of the tongue had been much restricted. No enlarged lymph glands had been felt in the submaxillary region. On October 5, 1896, the patient had been operated upon under ether, a preliminary tracheotomy having been performed to allow of the administration of ether through the tracheal opening. Kocher's incision for the removal of the tongue had been made, and the contents of the right submaxillary triangle, together with the tongue, had been removed. Two slightly enlarged glands had been found just beneath the angle of the jaw, and these had been removed. The right lingual artery had been tied in the wound. A large sponge had then been inserted in the pharynx, and the floor of the mouth opened. The tongue had been removed with scissors, except a small portion on the left side, about two inches long and three fourths of an inch wide. All of the right tonsil and a portion of the anterior pillar of

the fauces on that side had been cut away. The pharyngeal sponge had then been removed, and the cavity of the mouth packed with iodoform gauze. A strand of gauze had been passed from the floor of the mouth through the wound for drainage, and the remainder of the wound closed by sutures. Rectal feeding had been practised for four days, after which the tracheotomy tube had been removed, and the patient had been fed by the stomach tube passed down the œsophagus. On the fifth day the patient had been allowed up for a time. On the ninth day he had begun to take liquid food by the mouth, and by November 1st the external wound had been practically closed.

The speaker said that the case was presented, partly because of the general interest of these cases, and partly because at first he had felt that it was hardly worth while to remove the growth at all. He was now glad that he had done so, for the patient was quite comfortable. As yet there was no sign of recurrence. The patient was entirely free from pain. His speech could easily be understood, and he was able to swallow without difficulty. The speaker wished to call the attention of the members of the society, especially those who were not surgeons, to the remarkable way in which the small portion of tongue left behind adapted itself to the new conditions in these cases. It had rotated into the median line, become adherent to the floor of the mouth, was movable, and formed a small but useful organ. Dr. Johnson then exhibited under the microscope sections of the growth; they showed it to be a typical epithelioma.

Choledocho-lithotomy.—Dr. Johnson also presented a young woman, twenty-seven years of age, who had been admitted to the Roosevelt Hospital on October 1, 1896. She had given a history of dyspepsia and constipation. Two years ago she had been ill with pain in the epigastrium, vomiting of greenish material, flatulence, and jaundice. The pain had subsided after two weeks, but the jaundice had continued. A year after this she had had another similar, but more severe, attack, beginning with a chill and causing much prostration. Her present attack had begun six weeks before admission, with a severe chill and pain in the right hypochondrium and epigastrium. She had suffered from frequent vomiting, anorexia, profuse sweating, and increased jaundice. There had been some tenderness over the upper portion of the abdomen on the right side. One week before admission she had had another

chill, with very severe pain, frequent vomiting, and light-colored stools. On admission she had been somewhat emaciated, moderately jaundiced, slightly anæmic. The abdomen had been yielding, and there had been no evidence of tumor in the region of the gall bladder. At the operation a vertical incision had been made from the tip of the tenth costal cartilage downward for four inches. On opening the peritonæum, the edge of the liver and gall bladder had been exposed. The gall bladder had been found moderately distended, and surrounded by adhesions to the abdominal wall and intestine, and these had been separated. Palpation of the gall bladder had not then revealed the presence of stones. All the viscera in the neighborhood of the wound had been more or less adherent, but by following the gall bladder backward and to the right with the finger, a hard, rounded body had been felt, about an inch by an inch and a quarter in diameter. It had appeared to be situated in the common or cystic duct, close to the upper border of the duodenum. The wound had been enlarged at its upper angle by a partial division of the rectus muscle, and the hard body had been seized between the thumb and forefinger of the left hand. It could be moved a short distance in the direction of the gall bladder, but not toward the intestine. The tissues had therefore been incised over the duct, and the gallstone removed. Some bile had escaped into the peritoneal cavity. The wound had been washed with salt solution and closed with a double row of catgut sutures, a strand of gauze having been inserted for drainage. The highest temperature after the operation had been 100° F., and had occurred on the third day. The sutures had been removed on the eighth day. By the sixth day the jaundice had disappeared, the stools and urine had become normal in color, and she had been entirely free from pain. On October 31st she left the hospital with the wound healed, and apparently in perfect health. So extensive had been the adhesions that the speaker was unable to state what was the exact location of the stone, but it was apparently at the beginning of the cystic duct, compressing the common duct.

Dr. J. W. S. Gouley said that it was very wise to leave a portion of the tongue, as had been done in the first case. As could be observed, the stump had become adherent to the floor of the mouth and served to keep the larynx forward, thus preventing it from falling backward into the pharynx. It was quite remarkable

that such a small portion should enable the man to speak as well as he did. Such an operation, of course, would not have been possible without a preliminary tracheotomy. Our views of cancer and similar growths, Dr. Gouley said, had changed very much in the last twenty years, and it seemed clear to him that the growth in this case had been the result of the constant irritation produced by the rubbing of the tongue against a decayed tooth. The smoking had simply added another element of irritation. Cancers of the lip resulted from the smoking of a clay pipe particularly, as the stem of such a pipe was often short, and became sufficiently heated to cause a slight adhesion of the pipe stem to the epithelium of the lip. On the removal of the pipe a little abrasion resulted, and this frequently repeated process of irritation often led to the development of an epithelioma.

Dr. Russel Bellamy said that he had had the pleasure of being with Kocher for some time, and had noted a form of artery clamp used by him in his operations about the neck. He exhibited one of these clamps, and stated that it was maintained that the length of the shaft of this instrument caused little interference with the field of operation. Other features were the peculiar jaws, which secured a good hold, and the absence of the usual French lock. He thought the instrument would prove useful in an operation like the one under discussion.

Dr. R. J. Carlisle asked if there had been any evidence of suppuration in the bile duct in the second case.

Dr. Johnson replied in the negative.

Dr. George W. Crary asked what had been the effect of the escape of the bile into the peritoneal cavity, and also the quantity of bile that had been poured out.

Dr. Johnson replied that nearly a pint must have escaped into the peritoneal cavity, and much to his surprise there had not been the slightest evidence of irritation. He had understood from other surgeons that as long as the bile was free from infection it did not usually give rise to any trouble in the peritoneal cavity.

Referring to the Kocher operation, Dr. Johnson said that it was so much easier than any other operation for total excision of the tongue that he thought the surgeon would always prefer this method. There was no trouble from hæmorrhage, and even when the lingual artery was not tied the hæmorrhage was not especially troublesome, as the parts were kept on the stretch. Moreover, this was about the only operation which provided so perfectly for the removal of all the

tissues likely to be diseased. The entire contents of the submaxillary triangle—the lymphatic glands and fat—were removed, and one had perfect access to the floor of the mouth, the pharynx, and the whole tongue. Besides this, the drainage was perfect after the operation. The submaxillary lymph glands on the other side of the neck had not appeared to be enlarged, and no attempt had been made to remove them. In the specimen under the microscope it was evident that the epithelioma proper was sharply separated from the other tissues, and hence he had thought it safe not to invade the other side.

The PRESIDENT asked if Dr. Johnson had noticed that the glands at a distance from the submaxillary triangle were frequently involved. He had observed this in one case in which he had done a Whitehead operation, the recurrence being in the postcervical glands, while those in the submaxillary triangle had been unaffected.

Dr. JOHNSON said that he had once observed the recurrence take place in a gland very near the bifurcation of the common carotid.

Rupture of the Quadriceps Extensor Treated by Suture.—Dr. GEORGE W. CRARY presented a man who, on December 28, 1895, had fallen and received an injury to the left knee. A few hours later the swelling had been so great that thorough examination had been impossible. A few days later a simple rupture of the quadriceps extensor femoris had been diagnosticated. The operation of suturing had been performed on January 3, 1896, under ether anæsthesia. A transverse incision had been made above the patella, about five inches long, and over the sulcus between the divided ends of the muscle. The rupture had been found to be about an inch above the upper border of the patella. The cavity of the joint had contained a certain amount of blood clot and serum, and had been washed out with salt solution. The distance between the divided ends of the muscle had been about an inch, and there had been no attempt at repair. The ends of the torn muscle had been brought together by a continuous suture of No. 2 catgut. This had caused a slight folding of the crurens. A few deep sutures and fine silk sutures had sufficed to close the wound without drainage. A plaster-of-Paris dressing, strengthened by a wooden splint, had been applied. The highest temperature after the operation had been 100.5° F. On January 10th a fenestra had been made in the splint over the wound and the dressing removed. The

wound had healed perfectly, so the stitches had been removed and a light antiseptic dressing applied. On February 1st the entire dressing had been removed and a lighter plaster splint applied. On February 14th he had been allowed out of bed. The plaster splint had been discarded at the end of nine weeks, and for a few weeks longer he had worn a starch bandage. At present there was almost perfect function of the knee, and within two months after the injury he had been able to go up and down a step-ladder—a good test of the functional result.

Dr. JOHN F. ERDMANN asked why Dr. Crary had not adopted the longitudinal incision so often employed in wiring the patella. The advantage was that if subjected to sudden strain it would not give way as the transverse one occasionally did.

Dr. CRARY said that while the longitudinal incision might answer for the operation on the patella, it would not give sufficient room, without extensive dissection, in a case like the one he had presented. If a fall had caused a tearing through of the skin, it would almost certainly have caused a secondary rupture of the muscle, and under such circumstances the tearing of the skin would be a secondary matter.

Dr. ERDMANN remarked that he had known the skin incision to give way without a breaking of the patella. In one difficult case of secondary fracture of the patella he had not had the slightest trouble in again suturing the patella through the longitudinal incision.

Dr. CRARY said that the transverse incision for the patella would be located immediately over the point of greatest tension of the skin, while the transverse incision for suture of a ruptured quadriceps extensor would not be so placed.

Dr. JOHNSON said that the result obtained in the case presented by Dr. Crary was a remarkably beautiful one—better than any he had before seen.

Paper.

REPORT OF TWO SUCCESSFUL CASES OF PROSTATECTOMY.

By LUCIUS W. HOTCHKISS, M. D.

The first case I have to report is that of a man, sixty-seven years of age, who was twice a patient during my service at the J. Hood Wright Memorial Hospital.

He was first admitted in November, 1895, with an attack of acute retention of urine, which his physician had been unable to relieve by the use of the catheter and for which suprapubic aspiration of the bladder was resorted to.

His previous history was indefinite, but indicated that he had been suffering for some time with difficulty in emptying his bladder. He was in possession of a dirty catheter which, he said, he had been in the habit of using occasionally for several months. At this time he had a very acute cystitis, and the prostate could be felt as a very large tumor projecting backward toward the rectum. His urine was very foul, and the calls to urinate were very frequent. The amount of residual urine varied from four to six ounces or more. He was treated by rest in bed and daily irrigations of the bladder with various solutions. Under this treatment he improved considerably, his residual urine diminished in amount, and he was quite comfortable. The size of the prostate, as evidenced by rectal touch, seemed somewhat decreased, and at the end of about a month, when he was discharged to become an out patient, he could pass his urine himself without much difficulty. He was instructed how to keep his catheter clean and how to use it. At this time he was anxious to have some operation performed for his permanent relief, but his apparently feeble condition and the fact that he had improved so much under palliative measures led us to decide against it at that time.

On January 22, 1896, he was readmitted to the hospital, suffering with another severe attack of cystitis. He had failed to report as advised, and had neglected the instructions as to the necessity of cleanliness in the use of the catheter, his nature and environment being such that cleanliness seemed an impossible attainment.

Examination at this time revealed a very much enlarged prostate. A catheter was made to enter the bladder with considerable difficulty, and about four ounces of very turbid ammoniacal urine were withdrawn. His

temperature was normal. The urine was 1.019 specific gravity; alkaline; full of pus and albumin. The old man was suffering intensely with vesical pain and frequent and difficult urination. He was much worn from loss of sleep, and appeared quite feeble. He was put to bed, and his urine drawn and bladder irrigated twice a day with a solution of permanganate of potassium, 1 to 2,000.

Under this treatment he obtained some relief, but on February 10th suffered from an attack of retention. The catheter withdrew fifteen ounces. From this time until the end of the month, when the operation was done, he continued to have pain and did not stand catheterism so well. As it did not seem possible for a patient to maintain catheter life safely under the conditions in which he was obliged to live, a suprapubic cystotomy was determined upon, with a view to maintaining permanent drainage in case it should not be found feasible to remove the prostate.

On February 29, 1896, a little over a month from the date of his admission, ether was administered and a suprapubic cystotomy done in the usual manner. After opening the bladder the large prostatic tumor could be felt by the finger. The enlargement of the lateral lobes seemed most marked, and the contact of their opposing sides with the prostate congested would seem to explain, in this case, the mechanism of his frequent attacks of retention. The middle lobe also projected somewhat, but did not constitute a distinct bar to the urethral outlet.

The pelvis of this patient was very deep, and considerable difficulty was experienced in enucleating the gland. An assistant aided me very much, however, by pushing up the prostate through the anterior wall of the rectum with his finger. The mucous membrane was spared as much as possible, and an attempt was made at a clean enucleation. This, however, was impossible, and the large succulent growth was removed piecemeal by the fingers and scissors. The specimen shows, I think, those portions of the median and lateral lobes which projected into the bladder and encroached upon the urethral outlet, and, though it is shrunken somewhat in the alcohol, represents a prostate of large size.

There was considerable oozing of blood during the enucleation, and the operation was prolonged and difficult. At its close the cavity of the bladder was packed with gauze, and drainage established by means of a large catheter through the suprapubic wound. Shock

considerable; good recovery from ether. There was some hæmorrhage during the night which yielded readily to irrigation of the bladder with hot saline solution. The patient went along very comfortably for about ten days, the temperature never rising above 100° F. On the 11th of March, following an attempt to remove the suprapubic drainage-tube, the temperature went to 103.8° F., and the patient had considerable pain. The tube was reintroduced and left for a few days more, the wound in the meantime granulating nicely, and temperature falling nearly to normal. By the end of March the patient was able to pass a small amount of urine voluntarily and the wound had nearly closed. After this time, when he began to sit up, the leakage became less, and he was able to pass more urine through the natural channel. On April 2d it was found that the catheter passed eight inches before entering the bladder, whereas just before the operation the urethral distance measured ten inches before the urine flowed. A rectal examination showed but very slight enlargement at the situation of the prostate.

On the 6th of April he could retain his urine for several hours and pass voluntarily seven ounces. No urine comes through the fistula, though there is slight leakage when the bladder is distended during irrigation. The patient has slight dribbling away of urine from the urethra when standing.

May 2d.—The wound is closed.

11th.—The patient is discharged.

As a result of this rather severe procedure in an old man a very good functional result was obtained. The patient was seen about two months ago. He has discarded the catheter, is able to pass his urine voluntarily, and says he feels very well. I am unable to state exactly whether he still has residual urine or how long the intervals are between the acts of urination. His condition when he left the hospital was certainly good, and has evidently much improved since that time. I shall endeavor at some later time to make more accurate observations upon the final result of the operation.

The second case which I have to present is one of perineal prostatectomy in a man sixty-six years of age.

This patient was admitted to Bellevue Hospital on August 24, 1896, and the following brief history was ob-

tained: Since the age of twenty he has had several attacks of gonorrhœa. Ten years ago he began to have serious difficulty in urination, which culminated in an attack of retention which was relieved by aspiration of the bladder above the pubes. He remained in the hospital for a time and an external urethrotomy was performed for the relief of his strictures. As a result of this operation his condition was much improved, but in a few months his trouble in urination began to return.

He says he has used the catheter occasionally ever since this time, and for the three weeks preceding the date of his admission to Bellevue he had used it constantly. He had suffered from frequent and painful urination for a long time, but for the previous three weeks the irritability of the bladder had become so intense and the spasm so painful that he had been obliged to pass water every few minutes, and had frequent attacks of retention, for which he resorted to the catheter.

On admission he presented symptoms of a very acute cystitis and his sufferings were intense. A catheter withdrew six ounces of urine, which was alkaline, of low specific gravity (1.010), and full of pus and mucus.

The patient could obtain no rest by night or day on account of the extremely painful tenesmus of the bladder. This clearly was not a case for rest in bed, with catheterization and irrigation. It was a case which seemed to call for immediate and free drainage of the bladder.

On August 25th ether was administered and a median perineal cystotomy performed in the usual manner. Previous to the operation the capacity of the bladder had been proved so small that the perineal route had been chosen as the simpler method of entering the small contracted viscus.

On examination of the bladder through the perineal wound by the finger, the lateral and median lobes of the prostate could be felt very much enlarged. The encroachment on the calibre of the urethral outlet of the bladder, in this, as in the other case, seemed to be due to the apposition of the greatly enlarged lateral lobes of the prostate. Tearing through the mucous membrane over these enlarged prostatic masses with the finger nail, I succeeded in enucleating with some difficulty nearly the entire prostate. I regret that the specimen has been lost. The prostate, in this case as in the other, seemed rather soft and succulent. The middle portion was the most difficult to remove, being almost beyond the reach of my finger.

At the completion of the operation the bladder was drained by a large catheter through the perineal wound and siphonage arranged for after the patient was put to bed. The hæmorrhage was moderate, the shock comparatively slight, and the patient rallied well from the ether.

His bladder was irrigated twice daily with a weak solution of permanganate of potassium.

On September 3d, the tenth day after the operation, he was sitting up. His symptoms were at once relieved by the operation and his convalescence was uninterrupted. He was discharged September 22d, a little less than a month from the date of his admission. At this time the perineal wound had healed save for a small granulating surface. There was no fistula. The patient could pass his urine himself without pain. His cystitis had improved so much that urinary examination, September 12th, showed no albumin, and it was much clearer, although still alkaline.* I have not seen the patient since his discharge from the hospital, but consider the result, as regards function of his bladder and improvement of his cystitis, as very good.

In comparing and contrasting these two cases of prostatectomy we are struck with certain points of similarity as regards the probable mechanism of urinary obstruction in both patients.

In both we notice, as a result of the establishment of free bladder drainage, an almost immediate recession and disappearance of distressing pain and tenesmus.

I was struck with the comparative ease and readiness with which the prostate could be removed by the perineal method in this case, a method which is now generally abandoned on account of the difficulty in many cases of reaching and dealing with the enlarged gland. The method proposed by Alexander, of a combined suprapubic and perineal prostatectomy, would seem in many cases to be a most practical operation, combining, as it does, many of the advantages of both methods.

In the first case the suprapubic drainage was, as it often is, most uncomfortable for the patient. The dressings were constantly wet for the first few days and needed

* The patient reported at the hospital three months after the operation, and said he could pass urine as well as when he was a boy.

repeated changes, as did the bed linen and clothes of the patient. This seems unavoidable in the many cases where, for various reasons, the bladder opening can not be closed tightly about the tube and where it is essential to maintain bladder drainage for some time. The discomforts to the patients of this method of drainage, as compared with those in case of the perineal method, seem incomparably greater. I do not wish to be understood, however, as drawing definite conclusions from these two cases. My object in presenting for your consideration these cases of prostatectomy is not to put forward any new principle in the treatment of prostatic obstruction, but rather to call to your minds the underlying principle of success in these operations of prostatectomy—viz., the complete removal of the obstruction to urination and the establishment of free bladder drainage.

Remembering that the operation is designed to prolong life in a class of sufferers who are frequently enfeebled by age and in whom the bladder trouble is often complicated by lesions of other viscera, especially the kidneys, we should not be surprised if the mortality seems disproportionately large. The unfavorable condition of many patients who are the subjects of this operation is one which the surgeon must accept beforehand as a factor in increasing the death-rate. This fact is strikingly illustrated when we recall the fact that the operation of castration, which under ordinary circumstances has no mortality, shows in these cases of old prostatic disease a mortality nearly if not quite as large as the much more serious operation of prostatectomy.

According to the recent statistics of Cabot,* out of two hundred and three cases of castration for enlarged prostate there were thirty-nine deaths, a mortality of 19.4 per cent. The same author collected reports of twenty-two cases of ligature and division of the vas deferens, with seven deaths. He attributes the high death-rate in these so-called minor procedures to the

* A. T. Cabot, *Annals of Surgery*, September, 1896.

fact that in castration for enlarged prostate the diminution of the size of the organ is often so slow as to be of little immediate use in stopping the back pressure on the kidneys, which is especially harmful at a time when the operation has laid a fresh stress of work upon them. The mortality rate in cases of suprapubic prostatectomy was, in the earlier series of cases, estimated as high as twenty-five per cent. Later tables show that with increased familiarity in the technics it is safe to place it at a considerably lower figure. Cabot thinks it safe to place it below twenty per cent., and considers it fair to assume that with added experience in the operation the death-rate will be greatly reduced.

With a mortality no greater or slightly less than that of castration for prostatic hypertrophy, with the further advantage of allowing thorough exploration of the bladder for other possible conditions, and with the possibility of complete removal of the obstruction and thorough drainage of the bladder, the operation certainly should be ranked as a thoroughly justifiable and satisfactory method of procedure in properly selected cases.

In cases of prostatic obstruction, complicated by an intense cystitis, some method of treatment which includes free bladder drainage as well as the removal of the enlarged gland would seem to be imperative.

Dr. S. Alexander said that he had been much interested in the comparison of the two methods of operating, and he was glad to find that the author of the paper had come to the conclusion that the perineal route was the better. This had been his own opinion for a number of years. In the majority of cases of very large prostate, he did not think the operator would find it desirable to remove the prostate through the perineal incision alone. In his method of performing prostatectomy, suprapubic cystotomy was done so that the entire gland could be brought within reach and completely removed. For purposes of cleanliness and disinfection of the bladder he had found that the suprapubic incision was of great advantage, the tube being left in for five or six days, and all the washing being done through the upper tube. He would like to ask

whether the president had made his incision through the mucous membrane of the prostatic urethra.

The PRESIDENT said that his incision had extended through the prostatic urethra, but not through the prostate.

Dr. ALEXANDER, continuing, said that by his method the prostate could be pressed downward so that it would be possible for the operator to shell out the entire gland without opening the prostatic urethra or injuring the mucous membrane of the bladder. He felt confident that this could be done in the majority of cases, and when this was the case, the hæmorrhage was much less, and there was not so much danger of septic infection. He was not prepared to say that the method by the suprapubic route alone should be abandoned in all cases, for, in some instances, it was possible that it might prove superior to the perineal route. It might be of special advantage in moderately enlarged fibrous prostates, but it had so happened that he had not met with cases of prostatic enlargement which he believed could not be removed through the perinæum by the submucous method. Some cases of so-called "bar" at the neck of the bladder were suitable for prostatotomy, but not for prostatectomy. He would be glad to know whether there was any residual urine in the first case, because from what had been said about the difficulty of reaching down into the prostate after it was opened, and the fact that not all of the prostate had been removed, he was inclined to believe that the operation had not been entirely radical. Cases of relapse after prostatectomy were due, in his opinion, to insufficient removal of the enlargement. Where the entire enlargement had been extirpated, we might confidently expect entirely voluntary micturition, but where only portions were removed—particularly in the earlier operations performed after McGill's method—relapse was not infrequent. This was due to the habit of surgeons of tearing away only those portions which seemed at the time to be causing obstruction.

Regarding the mortality of the operation, the speaker said that he felt the death-rate would improve with individual operators as their technics improved, and as the operation was done earlier. So many patients at the present time were operated upon late—as in the case under discussion, where the bladder was septic and the patient exhausted—that the death-rate was sure to be unnecessarily high. In several of these cases he had

performed perineal section and drained the bladder for several days prior to the operation. He had found this procedure very satisfactory, and believed it had been the means of reducing the death-rate. The remarks of the reader of the paper regarding castration for prostatic obstruction should be given careful consideration.

Dr. Gouley said that it was now eighteen years since he had introduced to the medical profession in America the method of operating devised by Mercier, of Paris. At that time, every one had been opposed to it, and one surgeon had stated that Dr. Gouley was the only one in this country who performed the operation, and probably would be the only one. In England these operations had been attacked very violently, and only one surgeon in that country had advocated surgery on the prostate. The majority of the Continental surgeons had been opposed to such surgery, although a few of them had operated upon the prostate for cancer—a class of cases for which Mercier had never intended his operation. Mercier had been very successful in prostatotomy for "valvules" at the neck of the bladder. He had distinguished two kinds of "valvules"—viz.: (1) The muscular, crescentic valvules made up of mucous membrane and a few bands of muscular tissue; and (2) the prostatic valvules, which were really enlargements of the posterior third of the lower isthmus of the prostate. This operator had been quite successful when the enlargement had been confined to the posterior third of the lower isthmus of the prostate, and he had done over four hundred such operations. Dr. Gouley said that in 1878 he had performed both these operations in this country, and he believed that he had given them the names "prostatotomy" and "prostatectomy"; and although not very good names, they had been quite generally adopted. Those who thought any prostate could be enucleated with impunity would be disappointed if they attempted it. The so-called hard prostate could not be enucleated. At his suggestion, Dr. Alexander had tried it on the cadaver, and had given it up. The operation of enucleation was applicable only to the large, soft prostate—that which consisted simply of dilated acini. He had succeeded in removing the greater part of a prostate containing eighteen concretions. He believed the operation devised by Dr. Alexander was destined to replace Dr. McGill's operation and any suprapubic operation. It was impossible to remove a very large prostate by either the suprapubic or the perineal

method alone. It was probable that hereafter very little would be heard of McGill's operation.

Regarding the president's operation, Dr. Gouley said that it had been very successful in view of the involvement of the bladder. If there was reason to suppose that the kidneys were involved, the operation should not be performed; it was better in such cases to depend upon the suprapubic incision for drainage alone. He feared that too many of these operations would be undertaken unless the young surgeons took into consideration the great danger of pyelonephritis, which might already exist, and which would then be rendered acute by any extensive surgical operation. In such cases, masterly inactivity was far better than radicalism.

The PRESIDENT said that in the first case it had seemed to him that the prostate had been pretty thoroughly removed. The fact that the urethral distance had diminished two inches from just before the operation to the time when the patient had left the hospital would seem to indicate that there had been considerable diminution in the bulk of the prostate. In both of the cases he had started to do a cystotomy alone for the purpose of draining the bladder, but on opening the bladder he had found the prostate so fairly accessible that he had been tempted to try its removal. The operation devised by Dr. Alexander seemed to him an extremely feasible one, although he had never performed it. He had, however, employed the perineal incision of Dittel in cases of abscess of the prostate, and had been very favorably impressed with it as a means of approaching the prostate gland. Judging from his limited experience, he thought the prostate might often be enucleated through the perineal incision alone without the necessity of a suprapubic cut.

Meeting of December 2, 1896.

The President, Dr. LUCIUS W. HOTCHKISS, in the Chair.

Paper.

FOUR CASES OF VESICAL CALCULUS REMOVED BY LITHOLAPAXY UNDER LOCAL ANÆSTHESIA.

BY SAMUEL ALEXANDER, M. A., M. D.,

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I DESIRE to present for your consideration the report of four cases of vesical calculus, upon which I have recently operated by litholapaxy, using cocaine locally as an anæsthetic.

The technique employed has been the same in each operation, and is as follows: The patient's bowels having been emptied, he was given, half an hour before the operation, a subcutanous injection of a sixth of a grain of morphine and a hundredth of a grain of atropine, and fifteen minutes later he was given an injection of a fiftieth of a grain of glonoin and a thirtieth of a grain of strychnine. He was then placed upon the table and the bladder emptied and thoroughly washed with sterile borax solution. Two ounces of a four-per-cent. solution of cocaine hydrochlorate were then injected into the bladder, the catheter being withdrawn into the prostatic urethra, so that the solution should be brought into contact with the deep urethra. The anterior urethra was then filled with two drachms of the cocaine solution, which was retained for five minutes. At the expiration of this time the anæsthesia was complete. The lithotrite was then introduced, the stone fragmented, and the detritus removed by the evacuator in the usual manner. In all four of the cases thus treated the anæsthesia was complete and remained practically so until the end of the operation. In two of the cases in which the operation was prolonged, in one for forty minutes, in the other for an hour, some discomfort was caused during the last few minutes of the operation by the use of the evacuator; but at no

time did the patients complain of pain sufficiently severe to require a renewal of the anæsthetic. In the other two cases, in which the operations lasted twenty-five and twenty-eight minutes respectively, there was an entire absence of pain and discomfort. All of these operations were performed upon old men. Three of them had obstructive enlargement of the prostate; the fourth had been operated upon by me three years before for prostatic enlargement, and the entire prostate was at that time removed by submucous enucleation together with about fifty prostatic calculi.

Three of these patients had general arterial sclerosis and chronic nephritis, and were exceedingly bad subjects for any operation requiring a general anæsthetic.

In none of the cases were any bad effects observed from the cocaine. In the first case operated upon the patient was somewhat excited during the first two or three minutes of the operation, but this very soon disappeared.

There was in one case a slight acceleration of the pulse, amounting to an increase of ten or fifteen beats in the minute. In two of the cases the operation was performed late in the afternoon, and the patients were wakeful during the night. In three of the cases the operation was difficult, owing to the large size of the prostate. The time required to perform these operations was a little longer than would have been taken had a general anæsthetic been used.

The preliminary treatment in these cases—viz., the use of full doses of glonoin and strychnine—was employed at the suggestion of my colleague, Dr. Hermann M. Biggs. I believe it to be of value in counteracting the dangerous action of cocaine upon the heart and circulation. It certainly acted well in the cases under consideration. There can be no question of the value of local anæsthesia in cases of calculus in which the blood-vessels and upper urinary organs are diseased, and I believe that litholapaxy in these cases can be much more safely performed under local anæsthesia than any other operation.

Case I.—T. B., aged eighty years. I was asked to see this patient by Dr. W. W. Varrick, of Jersey City, in September, 1896. He gave a history of prostatic enlargement of several years' duration, and had had well-marked symptoms of vesical calculus for more than six months. He complained of great frequency of micturition and of pain before and after it, the latter being especially severe, of a burning sensation along the entire urethra, of sudden stoppage of the stream before the completion of the act, accompanied by pain at the end of penis. He was obliged to pass water every half hour, day and night, and was rapidly losing ground. He was using a catheter once daily, and was washing his bladder twice a week with a solution of borax.

His urine was loaded with pus, and deposited on standing a tenacious mass of altered pus and phosphates; specific gravity, 1.019; reaction alkaline; odor ammoniacal. It contained albumin, pus, blood, crystals of triple phosphates, and amorphous phosphates; no casts were found. Rectal examination showed a symmetrical enlargement of the prostate. Residual urine two ounces. Capacity of bladder two ounces and a half. The mucous surface of the bladder was trabeculated and exceedingly sensitive. A calculus about an inch and a quarter in diameter was detected by the searcher. The patient's arteries were hard, and his pulse feeble and intermittent.

I prescribed rest in bed, a fluid diet, large quantities of diluents, and vesical irrigation twice daily with solution of nitrate of silver, 1 to 6,000. On September 28th Dr. Varrick reported that the patient's bladder had improved and that he was ready for operation. On September 29th I did a litholapaxy under cocaine anæsthesia, removing one hundred and thirty-six grains of calculus, mixed uric acid, and phosphates.

The operation was difficult, as the posterior prostatic pouch of the bladder was very deep, and each fragment of the calculus had to be picked up from the bottom of this pouch and then crushed. The last fragment was found with difficulty, and this delayed the operation some fifteen minutes.

The operation was entirely successful. A search made ten days after the operation showed the bladder to be free from calculus. The patient uses a catheter twice daily and washes the bladder with mild silver solution. He is free from pain, and sleeps the entire night without passing water.

Case II.—I. F., aged seventy years, was referred to me on September 27th, by his physician, as a case of

prostatic enlargement, with a request that I perform a prostatectomy. The patient had suffered for ten years with frequent micturition and pain. He had twice had retention, and had been taught to use a catheter and to wash his bladder, which he did at irregular intervals. For more than a year past he had had well-marked symptoms of vesical calculus, pain at the end of micturition, sudden interruption of the stream, followed by pain at the end of the penis, frequent desire to urinate, and, at times, bloody urine. The patient was thin and haggard; his blood-vessels were hard; he had a mitral regurgitant murmur, with increased area of cardiac dullness; heart sounds feeble. Rectal examination showed a moderate enlargement of the prostate. The urine was very dirty, with a thick and tenacious sediment; specific gravity, 1.016; reaction alkaline; odor ammoniacal; albumin in considerable amount, pus, blood, and amorphous phosphates, and a few granular casts. The capacity of the bladder was four ounces. Residual urine, two ounces and a half.

A calculus about an inch and a half in diameter was detected by searcher. I operated on September 30th and removed one hundred and forty-eight and a half grains of phosphatic calculus under cocaine anæsthesia. Time of operation twenty-eight minutes. There was absolutely no pain during the operation, and the soreness of the urethra, caused by the instruments, had disappeared on the fourth day. Patient walked to my office on the seventh day and was searched. The bladder was found free from calculus. He now uses catheter twice daily and washes his bladder with a weak solution of the nitrate of silver. The urine still contains some pus.

Case III.—J. G. S., aged seventy-three years, was admitted to my service at Bellevue Hospital on October 5, 1896, with a diagnosis of prostatic enlargement and vesical calculus.

His symptoms began nineteen years ago with frequent desire to micturate, pain and burning in the urethra; both of these symptoms being aggravated by jolting. He had had frequent attacks of hæmaturia, the blood passing at the end of the act of micturition. The stream was suddenly arrested before the completion of the act.

He states that when these symptoms first appeared he called in a physician, who gave him internal remedies, and that he obtained relief for nearly a year. He had since then had several similar attacks, lasting from four

to six weeks, and had been medically treated during these periods. For some months past he had been using a catheter and having his bladder washed out. Nine weeks ago he had an especially severe attack, accompanied by complete retention of urine. Dr. M., who treated him during this attack, relieved his retention, and, detecting the presence of a vesical calculus, advised him to come to the hospital. On admission the patient complained of great frequency of micturition, severe pain both before and after urination, urgency and partial incontinence, and burning along the entire urethra.

Rectal examination showed a large soft prostate. The capacity of the bladder was eight ounces. Residual urine four ounces. The surface of the bladder was very rough and extremely sensitive. A large calculus was detected with the searcher. The urine was very plentiful; specific gravity, 1.010; alkaline; it contained albumin, a large quantity of pus and amorphous phosphates, blood, and a few granular casts. Examination of the chest showed an enlarged heart, the apex beat being displaced to the left, and the area of cardiac dullness increased in size; no murmur heard; the heart sounds were weak.

Lungs slightly emphysematous.

There was well-marked general arterial sclerosis, the vessels being very hard and the pulse at the wrist incompressible.

The patient's condition was weak and feeble, and was most unfavorable for any operative measure. Owing to his great suffering, however, an operation was decided upon, and was performed before the class at my clinic on October 8, 1896. The operation was exceedingly difficult, owing both to the large size of the prostate and to the existence of a large diverticulum on the left side of the bladder, discovered after the operation had begun, into which fragments of the calculus fell and could not be removed by the evacuator. In attempting to remove all of these the operation was prolonged to nearly an hour. Six hundred and thirty grains of detritus of mixed urates and phosphates were removed. The anæsthesia was complete until the last two washings; the patient then had some discomfort, but at no time during the operation did he complain of pain.

On the day following the operation he had complete retention, due to swelling and congestion of the prostate, as the result of the operation.

On October 12th he began to show symptoms of uræmia, was somnolent, and delirious in a mild way. His pulse became rapid and feeble. He was freely stimu-

lated, and on October 16th was much improved. His delirium had disappeared, and he sat up in bed during the afternoon. During the night of this day, however, he died suddenly.

The autopsy was performed by Dr. Brooks, of the Carnegie Laboratory, who has furnished me with the following protocol:

John S., Third Surgical Division, Bellevue Hospital, October 17, 1896. Nutrition poor; emaciation very marked. Rigor mortis present. Brain: Numerous and extensive areas of old meningitis; dura much thickened and adherent to bone. Submeningeal œdema.

Brain tissue soft, ventricles moderately distended by clear fluid normal in appearance. Arteries of brain show many small miliary aneurysms and extensive arteriosclerosis. A small aneurysmal dilatation (calcified) on left middle meningeal artery has nearly eroded through the calvaria, and many smaller aneurysms of same artery have imbedded themselves in the bone.

Heart: Weight twelve ounces; valves thickened and covered by patches of calcification. Muscle soft and flabby. Marked arteriosclerosis of coronary arteries.

Lungs show emphysema with chronic congestion.

Abdomen: Cæcum is folded back on ascending colon and bound by many adhesions to lower surface of liver. Vermiform appendix is bound to posterior wall of cæcum and is involved in an extensive mass of old adhesions; no evidences (direct) of perforation are found; mesenteric glands slightly enlarged.

Stomach: Small in size, distended with gas. Walls thickened and thrown into folds; color dark; mucous membrane shows extensive chronic inflammatory changes.

Pancreas negative.

Liver: Weight two pounds; small in size, of fairly firm consistence; surface smooth; color, purple with yellowish markings.

Gall bladder distended by single large oval stone about an inch and a quarter long by an inch wide; wall of bladder is thickened; duct is perforated.

Spleen small; capsule thickened.

Urinary System: Kidneys small; weight of each, two ounces; firm in consistence; capsule thickened and adherent; surface wrinkled; cortex thin; markings indistinct and irregular. Blood-vessel walls thickened; dark plum color; granular surface; extreme congestion, especially marked at borders of pyramids; œdema.

Bladder contracted; wall greatly thickened and

thrown into folds; mucous membrane dark, showing numerous old inflammatory areas. Four distinct saccculations of wall are found in the neighborhood of the trigon, and several depressions and areas of scar tissue in same locality; the sacs contain small fragments of broken stone in considerable quantity. The larger of the saccculations of the bladder wall have distinctly constricted necks, just posterior to middle lobe of prostate, as an area of ulcerating surface the size of a half dollar, evidently caused by the irritation of the calculus, which seems to have rested in this region. No lesions of either urethra or bladder which could have been caused by instrumental interference are present.

Direct cause of death would seem to be the acute or chronic nephritis. HARLOW BROOKS.

CARNEGIE LABORATORY, *October 17, 1896.*

CASE IV.—C. B., aged fifty-seven years. On January 22, 1894, I performed prostatectomy upon this patient, and removed at the same time about fifty prostatic calculi. He was discharged from the hospital cured, on March 22, 1894. He could then empty his bladder perfectly.

After leaving the hospital he was perfectly well until January, 1895, when he began to have pain in the right side, over the course of the ureter; this pain, which was not very severe, continued until March, 1895, when he had what he describes as an attack of "grippe." He was relieved of the pain after this attack, but noticed that he had to urinate more frequently, and at times he had pain after the completion of the act. These symptoms have continued up to the present time.

Six weeks ago he was seized with a sharp, sudden pain in the scar of the suprapubic wound, which continued for about ten minutes. Three weeks later a sinus opened in the middle of the scar, and on November 17th a little urine escaped from this sinus.

He was admitted to my service at Bellevue Hospital on November 26, 1896. Examination showed a small sinus about the middle of the suprapubic scar, through which a few drops of urine escaped during micturition. The patient complained of some frequency in micturition, and of pain when the act was completed. There were only three drachms of residual urine. A calculus two inches in diameter was detected by the searcher. On November 27, 1896, I operated under cocaine anæsthesia, removing two hundred and seventy-five grains of calculus with the greatest ease. The nucleus

was a uric-acid calculus with a thick phosphatic envelope. The patient has made a good recovery, and sat up on the fourth day. I propose later to close the suprapubic fistula.

In closing, let me say that litholapaxy operations under cocaine anæsthesia have been extensively performed by Dr. George Chismore, of San Francisco. Dr. Chismore, however, in cases of enlarged prostate complicated by calculus, does not attempt to remove the entire stone at a single sitting, but performs in these cases lithotrity in several sittings, removing with the aspirator the fragments crushed at the end of each. He uses local cocaine anæsthesia in all cases.

Dr. J. W. S. Gouley said that he had had no experience whatever with local anæsthesia in lithotrity, but that it was a commendable procedure. It was very important, it seemed to him, to take the precautions described in the paper, for otherwise, in the event of there being an abraded surface, the use of cocaine might be fraught with great danger.

The third case had especially interested him, because he had met with the same difficulties in removing fragments in cases of sacculation of the bladder. In such a case, if the diagnosis had been previously made of sacculated bladder, it did not seem worth while to attempt the operation, for it was impossible to remove all the fragments. The fourth case had been of extraordinary interest to him, not only because of the operation previously performed by Dr. Alexander, but because he had had an opportunity of examining the case recently. The whole of the prostate had been removed about three years before, and yet, on rectal examination, he had felt something which had seemed very much like the prostate. It was probable that the capsule had been filled up with scar tissue. It had had the form of the prostate, and had been extraordinarily smooth, but had lacked the gutter in the centre representing the course of the urethra. An autopsy in this case should prove very interesting, as determining whether there had been a new growth of muscle tissue, or simply the formation of scar tissue.

Dr. W. J. Chandler asked Dr. Alexander if he had used eucaine as a substitute for cocaine in these cases.

Dr. Alexander replied that he had used it in one

case of internal urethrotomy, but it had produced such intense irritation of the mucous membrane of the urethra that he had abandoned it. The pain from the application had lasted for fifteen or twenty minutes.

Old Pott's Fracture—Amputation of the Leg.—Dr. A. B. Johnson presented a specimen consisting of a portion of the bones of the leg and foot, taken from a man upon whom he had performed amputation of the leg four days before. Two years before, the man had fallen and injured this leg, and since then he had suffered from continued pain and disability. He had presented himself at the hospital some time ago, and a diagnosis had been made of an old Pott's fracture which had united with considerable deformity. Owing to certain peculiarities in the conformation of the foot and leg it had been decided that amputation was the best procedure. He was now glad that he had adopted this plan. The man had been suffering intensely from pain, not only when he walked, but when at rest. There had been an enormous production of new bone, growing from the tibia, and separating this bone from the fibula. The specimen showed a considerable degree of valgus, much relaxation of the internal ligament of the ankle joint, slight angular deformity and thickening of the fibula, and many, if not all, of the lesions of arthritis deformans. The cartilage of the ankle joint had undergone fibrous degeneration in places, in others it had undergone vascularization, in others it had atrophied, in still others the bone had been laid bare. The synovial membrane had also undergone atrophy and calcification. In this case Nature had evidently made a strong effort to make a new joint in a new position, and the articular surfaces, which had formerly been upon the tibia, were now upon the mass of new bone between the tibia and fibula.

Regarding the treatment, the speaker said that any operation which had aimed at division of the bone and replacement of the foot would probably have failed utterly, owing to the great irregularity of the surfaces. Again, a Syme's amputation would have left the mass of new bone, and probably would not have relieved the man's suffering. The removal of the articular surfaces of the tibia and astragalus might have been done, and the bones united in good position, but in all probability it would have been impossible to bring the lines of support through the tibia and astragalus, so that there would have been an increase of the valgus and a contin-

uance of the pain. The man was now free from pain for the first time in two years.

The Use of Antitoxic Serum in the Treatment of Diphtheria under the Supervision of the New York City Health Department, with a Resume of the Published Reports on this Subject.—Dr. HERMANN M. BIGGS read a paper under the above caption, of which the following is a summary: The use of diphtheria antitoxine prepared in the laboratories of the health department began January 1, 1895. At first, however, the serum was limited in amount and unsatisfactory as to strength. Foreign antitoxine at this time was difficult to obtain and high in price, averaging from eight to twelve dollars a dose (or eighty cents for one hundred antitoxine units, Behring's standard). The price now of antitoxine furnished by the health department is, for similar preparations, seventy-five cents to a dollar and a half (or ten cents for one hundred units).

Beginning first in the department hospitals, the health board antitoxine was, as soon as a sufficient quantity was available, employed in any case of diphtheria throughout the city, being administered by inspectors without charge on the request of the attending physician. During the period ending October 1, 1896, 1,352 cases regarded as diphtheria were treated in their homes by inspectors of the department at the request of the attending physicians, and 1,207 persons (excluding inmates of public institutions) who had been exposed to diphtheria were immunized by the administration of antitoxine. More than three thousand injections of antitoxine were administered and about six thousand visits made. This duty was performed by the medical inspectors, Dr. H. F. Koester, Dr. W. E. Studdiford, Dr. J. S. Ennis, Dr. L. K. Graves, and Dr. W. J. Pulley. These cases occurred, as a rule, among the very poorest classes in the tenement-house districts, in the most unfavorable surroundings, and were severe cases, often regarded by the physicians in attendance as hopeless, and usually came under observation late in the disease. In some of the later cases, however, not infrequently comparatively mild cases of diphtheria were referred for treatment, physicians having seen the effects of antitoxine on the course of the disease. Up to April 1st about eight per cent. of the cases treated were found moribund when first seen by the inspectors, while in the last six months the percentage was one half of this. Practically no other treatment was employed besides the administration of antitoxine; in some few cases strych-

nine, whisky, etc., were also given. In many instances the attending physician discontinued his visits after referring the case to the health department, as the family were unable to pay for his visits.

There has been from the first a continuous and marked improvement in the results obtained, owing, it is believed, to the increased experience in the use of this agent, the earlier application of the remedy, the better preparation of the serum, and the larger dosage employed. While in the first year the mortality from diphtheria was 17.9 per cent., during the last six months it was only 11.1 per cent.

For the carrying out of the plan adopted the city was divided into districts under charge of inspectors, who are always on duty and liable to be called upon at all times during the day or night. The requests for the administration of antitoxine are received at the offices of the health department, and immediately referred by police telegram or by telephone to the inspector in charge of the district in which the case occurs. In some instances recently, when several cases have been treated for the same physician, they have been referred directly to the inspector to save time.

Up to October 1st in all 1,352 cases regarded as diphtheria have been treated. Of these, 100 cases showed no Loeffler bacilli on bacteriological examination, were considered as false diphtheria, and excluded from the statistics; or were found to be true diphtheria later and were transferred to the Willard Parker Hospital; or the treatment was discontinued from some other cause. There remain 1,252 cases, of which 1,054 recovered and 198 died, the mortality being 15.8 per cent. Of the whole number, 856 were treated previous to April 1, 1896, and among these the mortality was 17.9 per cent.; 396 were treated from April 1st to October 1st, and among these the mortality was 11.1 per cent. While the difference in mortality may in part be due to the season of the year, yet it does not satisfactorily account for the whole difference.

Of the 1,252 patients 80 were moribund at the time of the first injection, or died within twenty-four hours after this. These may properly be excluded in a consideration of the utility of antitoxine in the treatment of diphtheria. There remain 1,172 cases with 118 deaths, or a mortality of ten per cent. Five hundred and seventy-four, or nearly half of the whole number, were reported by the inspectors to be in a bad condition

and suffering from very severe or septic diphtheria at the time of the first injection; 268, or about twenty-one per cent., were reported as in good condition, or apparently affected with a mild form of the disease when first seen. In 355, or more than twenty-eight per cent. of the whole number, the larynx, with or without the pharynx, tonsils, and nares, was involved. In 242 cases, in addition to the pharynx and tonsils, the nares were involved. One hundred and eight deaths occurred among the 355 laryngeal cases, giving a mortality of 30.4 per cent. Seventy-two of the laryngeal cases were intubated, and of these 29 died, or 40.2 per cent. In 283 laryngeal cases there was no operative interference, and in these the mortality was 27.9 per cent. Of the fatal laryngeal cases, in 38 the patients were moribund at the time of the first injection or died within twenty-four hours after it. If these are excluded, there remain 317 cases with 70 deaths, or a mortality of twenty-two per cent.

In the majority of the cases (793) only one injection of antitoxine was administered; in 352 two injections were made, and in 108 three or more. In all severe cases the initial dose was large, from 1,500 to 3,000 units, experience showing that the best results were obtained from large initial doses, and the tendency has been constantly to increase the size of this dose. As a rule, the patients were seen the second time at the end of twenty-four hours, and where it was considered necessary a second injection was then administered. They were afterward seen at intervals until the disease had terminated either in complete convalescence or death.

The serum employed has been generally of high grade, and during the last nine months has been at least twice as strong as Behring's No. 3—that is, it contained 300 to 500 antitoxine units in each cubic centimetre. Better results have been obtained with the high-grade preparations and with larger doses. There has also been a considerable diminution in the frequency and severity with which rashes have occurred since the use of the high-grade preparations of antitoxine in which smaller doses of serum are employed. Joint pains were of very unusual occurrence. In some of the early cases where large immunizing doses were given, severe joint symptoms, accompanied by prostration, occurred, and in a number temporary albuminuria. No case has come under observation where death could be ascribed to the administration of the serum, or where any permanent injury has been produced by it.

In all of the cases, with rare exceptions, in which the clinical features were unmistakable, the clinical diagnosis was confirmed by bacteriological examination. In a few cases the result of the bacteriological examination was indecisive, while the case was evidently diphtheria, and these have been included. In others bacteriological examination showed clearly that the case was false diphtheria, and these have been excluded. The usual practice has been, when the case was seen for the first time by the inspector, to administer an injection of antitoxine if it seemed clinically to be a case of diphtheria, and at the same time to make a culture from the throat for bacteriological examination. The course subquently depended upon the result of the bacteriological examination.

Immunizing injections, varying from 50 to 500 units, were administered to 1,207 persons in families where there were children exposed to the disease; in five children laryngeal diphtheria developed within twenty-four hours after the injection, and in seven others pharyngeal diphtheria appeared. All of these recovered on receiving further curative injections. In nine children diphtheria developed within thirty days after the immunization. All of these cases but two were mild, and the patients recovered; in one scarlet fever appeared on the second day and the patient died, in another severe diphtheria appeared on the fifth day, and the patient recovered after antitoxine was administered. From the data at command it would seem that the protective influence of the immunizing injections can not be depended upon to last longer than about four weeks, although in many cases the period is apparently longer. With the high-grade preparations of antitoxine now employed the amount of serum required for an immunizing injection is very small, from three to ten or fifteen minims, according to the age of the patient and the strength of the preparation, and since these small doses have been employed it has been unusual to see any disturbances (which sometimes ensued on the injection of large quantities of antitoxine) following the administration of an immunizing injection. Among the patients treated with injections in an infant asylum were an infant three weeks old, born at full term, injected with one hundred and fifty units, and weighing at the time of injection only four pounds three ounces, and another infant, premature, nineteen days old, born at the seventh month, still in the incubator, injected with

one hundred and fifty units, weighing only three pounds eight ounces. These infants had no reaction and no rash. Several pregnant women, in the eighth and ninth months, were also injected without harm.

From October 1, 1895, arrangements were made to furnish free antitoxine to physicians for use among the poor, on condition that reports of the cases thus treated should be sent in to the health department. This free antitoxine could be obtained from the druggists acting as agents upon the statement of the physician that the patient was too poor to pay for it. Blanks were also furnished, upon which a history of the cases could be filled out by the attending physician. This arrangement has not been very generally known, and only recently has been much utilized by physicians, so that the complete report has not yet been obtained. Up to October 1, 1896, 409 such cases have been reported, of which 34 proved on bacteriological examination to be false diphtheria, were transferred to Willard Parker Hospital, or had histories too incomplete for proper tabulation, and are therefore excluded; in the remaining 375, 307 patients recovered and 68 died, a mortality of 18.1 per cent.

The following *résumé* of the statistics and reports on the antitoxine treatment of diphtheria has been collected from the reports published in the various medical journals of the Continent of Europe, Great Britain, and the United States, beginning with the first extensive application of the new remedy in the early part of 1894 and bringing the subject up to October 1, 1896. In compiling these statistics, though the field has been carefully gone over, the collective investigations of Heubner, Monti, Eulenburg, the Kaiserliches Gesundheitsamt, and others, and particularly Welch's admirable review of the subject, have been made use of.

The first report of experiments made with the blood serum of immunized animals was communicated by Behring and Wernicke to the Seventh International Congress of Hygiene and Demography, in London, August, 1891. The earliest report of cases treated with antitoxine was in 1893, 30 cases treated by Behring in the Institute for Infectious Diseases in Berlin. In April, 1894, 233 cases of diphtheria, treated in the Berlin hospitals, with a mortality of twenty-three per cent., were reported by Ehrlich, Kossel, and Wassermann. About the same time Baginsky and Katz reported 163 cases, with a mortality of 12.9 per cent.,

treated in the Kaiser und Kaiserin Friedrich Kinderkrankenhaus in Berlin. But it remained for Roux to arouse the interest of the world in the discovery which Behring had announced three years before. Roux's masterly address, delivered at the eighth International Congress of Hygiene and Demography at Buda-Pesth, September, 1894, in which he reported three hundred cases of diphtheria treated with antitoxine in the Hôpital des enfants malades in Paris, really directed the attention of the whole medical profession to this subject, which has since become one of the most interesting in the history of medicine, and with this may be said to have begun the first extensive application of the new treatment of diphtheria.

In calling attention to the ways in which the value of the antitoxine treatment of diphtheria has been tested—viz., by statistics and by clinical study of the course of the disease—the various questions were discussed which might vitiate statistics of the kind, and it was shown how such fallacies might be avoided by comparing the mortality of a large series of cases treated by antitoxine with a similar series treated previously or simultaneously in other ways in widely separated places and over an extended period of time. Regarding the value of the evidence as to the efficacy of the remedy based on the clinical study, this, of course, depended on the confidence we placed in the opinions formed by the individual observers; but when the opinions expressed by many of the best clinical observers in all parts of the world were almost unanimously in favor of antitoxine, it would seem that there were no longer any reasonable grounds for refusing to accept the vote of the vast majority.

[A series of statistical tables was then presented illustrating the results of the antitoxine treatment up to the present time. The statistics contained all the larger series of cases which have been reported up to October 1st. No isolated cases were taken, only series of cases of ten and over. There had been no selection of cases and no reduplication so far as known, certainly none that could be avoided.

Table I showed the mortality of cases of diphtheria treated with antitoxine, and the previous or simultaneous percentage of mortality without antitoxine contained in 158 reports of cases in hospital and private practice. These cases included not only those of patients to whom in the early use of antitoxine were given in-

sufficient doses, but also of those who were moribund at the time or died within twenty-four hours after the first injection.]

In 109 reports from hospitals there were 15,560 cases with 3,009 deaths, or a mortality of nineteen per cent., with the antitoxine treatment; in 49 reports from private practice there were 9,208 cases with 995 deaths, or a mortality of 10.1 per cent.; or, in a total of 24,768 cases there were 4,004 deaths, a mortality of sixteen per cent., as against a previous or simultaneous mortality of thirty to forty per cent. (taking the lowest figures in the reports) without antitoxine. It would appear, therefore, according to these reports, that there has been a reduction of mortality in diphtheria in both hospital and private practice of at least fifty per cent., as the result of the antitoxine treatment. The lower percentage of mortality in private practice is probably due to the fact that these cases usually come under treatment in an earlier stage of the disease, and are generally more favorable cases.

[Table II gave the mortality of cases of diphtheria treated *with* and *without* antitoxine (taking the reports which showed these data) at the same time, and in the periods immediately before and after the serum treatment.]

From 45 reports in which these cases were recorded, there were 11,147 cases treated with antitoxine, resulting in 2,166 deaths, or a mortality of nineteen per cent.; while at the same time, or immediately before or after, there were treated 13,294 cases *without* antitoxine with 5,026 deaths, or a mortality of 37.8 per cent. Of these, 7,986 cases were treated in hospitals *with* antitoxine, with a mortality of twenty-one per cent., and 9,039 cases treated *without* antitoxine, with a mortality of 36.4 per cent. Three thousand one hundred and sixty-one cases were treated in private practice *with* antitoxine, giving a mortality of thirteen per cent., and 4,255 cases treated *without* antitoxine, with a mortality of forty per cent.

Thus put to the severest test, selecting the worst cases, as was often done for purposes of control and to prove the merits of the new remedy (though occasionally it was an unfortunate necessity, owing to lack of antitoxine, which compelled a forced interruption of the antioxine treatment), there is still a difference of fifty per cent. in favor of the antitoxine treatment.

Table III gives the mortality of diphtheria in the

Berlin and Paris hospitals for 1893, 1894, 1895, and the first half of 1896.

TABLE III.

	BERLIN HOSPITALS.			PARIS HOSPITALS.		
	Cases.	Deaths.	Per cent.	Cases.	Deaths.	Per cent.
1893	2,570	1,132	44·0	1,882	968	51·4
1894	2,890	801	27·6	2,355	837	35·5
1895	3,144	493	15·7	2,664	363	13·6
1896	1,100	151	13·6	1,298	199	15·3 1st half year.

From a comparison of the figures in the above table it appears that since the introduction of antitoxine into the hospitals of Berlin and Paris, according to the official reports, the mortality from diphtheria and croup has been reduced more than one half.

It has been maintained by some that in calculating the mortality from diphtheria, not the percentage mortality, but the absolute mortality is the only fair criterion of the value of antitoxine.

Table IV showed the actual number of deaths from diphtheria and croup in Berlin, Paris, and New York since 1888, including the first half of 1896.

TABLE IV.

	City of Berlin.	City of Paris.	City of New York.
1889	1,284	1,890	2,291
1890	1,586	1,859	1,783
1891	1,078	1,531	1,970
1892	1,405	1,557	2,106
1893	1,643	1,266	2,558
1894	1,430	1,009	2,870
1895	996	440	1,976
1896	294 (first half year)	329 (first half year)	1,392 (first three quarters of a year)

From this table it would appear that in the cities of Berlin, Paris, and New York since antitoxine came into more general use the absolute mortality has been conspicuously reduced. In New York the absolute mortality figures do not show quite so well as in the cities of Berlin and Paris, as the antitoxine has not been as generally

used in this city. But the percentage mortality shows a marked diminution in the death-rate. In 1894 there were in New York 9,641 cases of diphtheria and croup reported, with a mortality of 29.7 per cent.; in 1895 there were 10,353 cases, with a mortality of 19.1 per cent., and in 1896 (first nine months) there were 8,286 cases, with a mortality of 16.8 per cent.

H. Kossel shows also some striking statistics of a like character in refutation of the criticism made by Gottstein and others, that in order to prove that the reduction of mortality attributed to antitoxine has actually taken place it must be shown that there has been an *absolute* reduction of mortality at the same time that the number of cases of diphtheria has increased.

Table V shows the cases and absolute death-rate from diphtheria in the Berlin hospitals and in the city of Berlin.

Table V.

	Berlin Hospitals.		Berlin City.	
	Cases.	Deaths.	Cases.	Deaths.
1889	1,623	573	4,220	1,210
1890	1,792	695	4,586	1,601
1891	1,764	623	3,504	1,342
1892	2,074	837	3,683	1,637
1893	2,450	951	4,315	1,416
1894	2,890	801	5,220	1,321
1895	3,061	484	6,106	987

Taking the absolute death-rate from diphtheria and deaths to 100,000 in all the German cities of over 15,000 population, he gives the following:

Table VI.

	Absolute deaths.	Deaths to 100,000.	
1889	11,919	108	The average from 1886 to 1894 was 106.
1890	11,915	105	
1891	10,484	84	
1892	12,365	97	
1893	16,557	130	
1894	13,790	101	
1895	7,611	53	

These figures taken together would seem to prove conclusively that the absolute mortality from diphtheria has been reduced at the same time that the number

of cases have increased; and they prove, moreover, that the epidemic of diphtheria, in Germany at least, instead of being on the decrease has been steadily on the increase for the last six or eight years up to 1894 and 1895, when there was a sudden and marked decline in the death-rate, corresponding to the use of antitoxine. That would indeed have been a strange coincidence of natural causes which reduced the mortality of diphtheria for the benefit of antitoxine, instead of the reduction of mortality being due to the effects of the antitoxine.

One of the most significant effects of the antitoxine treatment is shown in the remarkable results which have been obtained in cases of laryngeal diphtheria with stenosis.

[Table VII gives the mortality of operative and non-operative cases of diphtheria treated with antitoxine.] In a total of 15,148 cases treated, taken from 72 reports, there were 2,626 deaths, or a mortality of 16.6 per cent.; of these, in 12,066 the patients were not operated on (eighty per cent.), and 1,491 died, giving a mortality of 13.5 per cent.; 3,082 were operated on, by intubation or tracheotomy (twenty per cent.), and 1,135 died, or 36.7 per cent. Previous to the antitoxine treatment forty per cent. of all cases were reported as having required operative interference. In the 3,082 operative cases 1,355 patients were tracheotomized, with 569 deaths, or a mortality of forty-two per cent.; 1,173 were intubated, with 361 deaths, or a mortality of 30.8 per cent.; 52 were intubated and required secondary tracheotomy, and 37 died, or seventy-one per cent.; 502 required tracheotomy or intubation (not stated which), with 168 deaths, a mortality of 33.2 per cent. According to Monti and Hirsch, the mortality in tracheotomy previously was 68.5 to 73.3 per cent. The best report of results of intubation in this country has been a mortality of forty-two per cent.; 1,173 were in- obtained in operative cases, according to these present reports, was seventy per cent. But, taking the lowest results recorded at all, 68.5 per cent. for tracheotomies and 51.6 per cent. for intubations, we see here, too, that there has been an apparent reduction of mortality for operative cases of about fifty per cent., while at the same time the number of cases requiring operative interference has been reduced one half, as the result of serotherapy.

Age is also an important factor in estimating the value of any treatment of diphtheria. Table VIII gives

the mortality of cases treated with antitoxine, arranged according to age.

TABLE VIII.

AGE.	Cases.	Deaths.	Per cent.	Previous mortality.
				Per cent.
0 to 2 years.....	1,494	469	31·4	63·3 } Baginsky.
2 " 5 "	3,678	762	20·7	45·3 } Baginsky.
5 " 10 "	3,184	473	14·8	24·6 } Baginsky.
Over 10 "	1,444	99	6·9	14·6 } Baginsky.

The contrasts shown here of the results obtained with antitoxine at the different ages and those obtained, according to Baginsky, previous to the use of antitoxine, are sufficiently evident and need no further comment.

Behring maintains that the specific curative effect of the antitoxine in diphtheria will be the more certainly excited the sooner the treatment is begun, and that out of one hundred patients with true diphtheria (showing the Klebs-Loeffler bacillus) who are injected with a curative dose of antitoxine within forty-eight hours of the beginning of the disease not more than five will die.

Table IX gives the mortality of patients treated with antitoxine, arranged according to the day of disease on which treatment was commenced.

TABLE IX.

	Cases.	Deaths.	Mortality, per cent.
First day of disease.....	1,415	51	3·5 } 6 per
Second day of disease.....	2,640	213	8·0 } cent.
Third day of disease.....	2,340	300	12·8
Fourth day of disease.....	1,458	346	23·6
Fifth day of disease and later.....	1,912	671	35·0
	9,765	1,584	16·1

According to these statistics it is apparent that by far the best results are obtained when treatment is commenced early in the disease, if possible within the first forty-eight hours, and not later than the third day; that after the third day the mortality increases rapidly, and that after the fifth day comparatively little benefit is derived from the use of antitoxine. Considering the fact that in all of these statistics are included the cases of persons who were moribund at the time, or died within twenty-four hours after the first injection, it would seem that there is very good reason to believe with Behring, Kos-

sel, Roux, and others that every fresh case of "true diphtheria" can be cured by the timely administration of an adequate dose of antitoxine; and that the contention that only five per cent. of the patients injected within the first forty-eight hours of the disease would die has actually been substantiated.

Dr. Biggs wished to bring out strongly and clearly the fact that it mattered not from what point of view the subject was regarded; if the evidence at command is properly weighed, he said, but one conclusion is or can be reached. Whether we consider the percentage mortality in cities as a whole, or in hospitals, or in private practice, or whether we take the absolute mortality for the great cities, or whether we consider only the most severe cases, the laryngeal and operative cases, or whether we study the question with relation to the day of the disease on which the treatment is begun, or the age of the patient treated—it matters not how the subject is regarded, in comparison with previous results, the conclusion is always the same—*i. e.*, there has been a reduction of mortality from the use of antitoxine in the treatment of diphtheria of not less than fifty per cent., and under the most favorable conditions a reduction to one fourth or even less of the previous rate. This has occurred not in one city at one particular time, but in many cities in many different countries at different periods and seasons of the year, and always proportionate to and in conjunction with the introduction of antitoxic serum. Then, finally, there is added the overwhelming mass of evidence derived from the personal observations of the most distinguished practitioners of medicine of every country.

It is well to bear in mind the fact that what is called "conservatism" in medicine is often a cloak assumed to cover up indolence. The acceptance of a new principle involves the expenditure of a certain amount of mental energy; the old ideas must be discarded or adjusted to the new; new information must be acquired; this all requires labor and effort. Some are not willing to expend them, nor are they willing to go over the data at hand and form conclusions for themselves. They only shake their heads wisely and predict a reaction and plead "conservatism." Do not mistake the nature of the motive of their action; it is simply indolence, not conservatism. I have no hesitation in saying that in my opinion no unprejudiced person can master the evidence now available regarding the value of antitoxine

in the treatment of diphtheria and reach anything but a positive conclusion, and it seems to me nothing less than criminal for any physician, without having gone over this evidence, to refuse to accept the conclusions of others and refuse to use this remedy in the treatment of diphtheria, especially occurring in children under ten years of age.

The deductions to be drawn from a review of these statistics and reports would seem to be self-evident and conclusive. The value of antitoxine in diphtheria is no longer a question of opinion or theory, but an established fact. Those who have had the largest experience with the remedy and have most thoroughly tested its merits are most in favor of it. The few who oppose it have proved nothing in comparison with the enormous mass of evidence as to its specific value.

It may, therefore, be affirmed that the following facts have been demonstrated:

1. That diphtheria antitoxine, where generally employed, has reduced the mortality from diphtheria at least one half.

2. That it has a distinctly favorable effect on the clinical course of the disease, shortening it and lessening its severity.

3. That the earlier the treatment is commenced the better the results obtained—the mortality, when adequate doses of antitoxine have been given within the first forty-eight hours of the disease, not exceeding five per cent.

4. That antitoxine is a specific against true diphtheria (*i. e.*, where the symptoms are due solely to the Klebs-Loeffler bacillus), and is less efficacious in mixed infections, but even in these forms of diphtheria is of decided benefit.

5. That it is not necessary to wait for a confirmatory bacteriological diagnosis, but that in every clinically suspicious case of membranous angina, especially in children, a medium dose of antitoxine should immediately be given, and repeated if required by the future developments of the case.

6. That antitoxic serum is a remedy without serious after effects in the doses which have ordinarily been employed (the after effects, such as rashes, etc., being insignificant in comparison with the danger of the disease); that it has no injurious action on the kidneys, the heart, or the nervous system; that it does not entirely prevent albuminuria, heart-failure, and post-diphtheritic

paralyses, because the effects of the diphtheritic toxine which has already entered the system before the administration of the remedy, no matter how soon the treatment is begun, are not always completely counteracted by the antitoxine, though there is every reason to believe that in sufficient doses it does prevent any farther extension of the toxic action after its effects have been produced.

7. That the protection conferred by immunizing doses of antitoxine is almost absolute for a short period of time—*e. g.*, three or four weeks, when a sufficient number of antitoxine units is administered—and that with a high-grade preparation, where only very small quantities of serum are required, the remedy is absolutely harmless, even with the youngest infants.

8. That antitoxine, if not a specific cure for all forms of diphtheria occurring in the human subject, is by far the best remedy for the treatment of the disease.

To the critics of the antitoxine treatment there may be repeated the words of a famous German poet, quoted by Professor Soltmann in his treatise on the subject:

"The best critics in the world are they,
Who along with that which they gainsay
Suggest another and a better way."

Dr. L. Emmett Holt said that he thought it must seem clear to all present that, so far as statistical evidence was concerned, there was practically nothing to be said on the subject of the antitoxine treatment of diphtheria after this presentation of these facts. These statistics seemed to him absolutely unanswerable. He had begun with a great deal of distrust and a great deal of timidity the use of this new remedy, but every month that he had seen antitoxine tested he had become more and more firmly convinced of its value, and at the present time it seemed to him we had no remedy for any disease that had as much in its favor as had antitoxine in the treatment of diphtheria.

Regarding the very high mortality of diphtheria in children under two years of age without antitoxine, he would say that in the New York Infant Asylum, before the days of antitoxine, the mortality among such children had been sixty-eight per cent. This included not only the bad cases, but also the tonsillar cases, and those in which perhaps the diagnosis had not been beyond dispute, for this was before the time when we had the advantage of a bacteriological diagnosis. He had had an opportunity of watching the effect of immuniz-

ing doses of the serum in very young children in the New York Infant Asylum, and in the Nursery and Child's Hospital. In these institutions between six and seven hundred children had been so immunized, and thus far not a single accident of any moment had occurred, and there had been no serious after-consequence. This was true even of the very young infants. He had seen at one time about fifty children under three months of age immunized with the serum, the dose generally being from fifty to a hundred antitoxine units. Fifty units was the quantity for children one month old or under.

As a member of the committee of the American Pædiatric Society charged with the collective investigation on the antitoxine treatment of diphtheria, the report of which had been published last summer, he had had to go over the reports sent in by the different physicians contributing to this investigation. These physicians, in reporting their cases, had over and over again made the statement that up to the advent of antitoxine they had come to the conclusion that no remedy had any particular value in the treatment of the disease, or that after the use of antitoxine they had seen the first case of laryngeal diphtheria recover in their practice. This had been the personal and almost unanimous vote of over six hundred physicians who had sent in reports. Such testimony carried much more weight than if these cases had been observed by half a dozen men, or in a single city or institution.

It seemed to him that the medical profession of this city owed the board of health a debt of gratitude for the way in which this whole matter of diphtheria had been handled by the department for the last three or four years. Personally, he felt under great obligations to them, not only for the work done in the production and distribution of antitoxine, but for other matters in connection with the diagnosis and management of diphtheria. He thought the profession in New York had been altogether too slow in recognizing this, although its value and importance were admitted all over the world.

Dr. W. P. Northrup said that if there were no accidents of any great importance after the antitoxine injections, there could be no possible objection to trying a remedy which had been so well recommended. He had been conversing with Dr. J. O'Dwyer that afternoon, and had learned from him that he had fre-

quently met with objections, even in physicians' families and about their own children, and these objections had seemed to come in waves, coincident with great opposition to the use of antitoxine, as expressed in the medical and lay press. Dr. O'Dwyer had said that he had never seen any accident from these injections. If it was well established that there was practically no fatal accident attending the injections, either for immunization or for the cure of diphtheria, it was our duty to urge the use of antitoxine on every possible occasion.

Having kept in touch with the progress of intubation, he had felt interested in knowing whether among all operators intubation had been required as often as formerly. He had found, on inquiry, that nine times out of ten when called to do intubation before 1895, it had been necessary to intubate, and usually at once; but that now in more than half of the cases intubation was not performed, although the serious nature of the case was shown by the fact that an expert intubationist had been called because of its urgency. Incidentally, it might be of interest, speaking of the reception of new things, to know what was the history of intubation. Dr. O'Dwyer said that there were three stages in the adoption of any new thing—viz.: (1) A stage of neglect; (2) a stage of ridicule; and (3) a stage of final acceptance. This had been the case with intubation, and the same had been true of antitoxine. It had now undeniably reached the third stage.

The two charts that had been presented this evening, showing the absolute mortality record for different countries and different cities, seemed to him to thoroughly answer the objection that the bacteriological diagnosis of diphtheria had made it possible to juggle with the figures. He also wished to pay a tribute to the work done by those who had engaged in the preparation of this paper, and also to the assistance that had been given by the board of health to the medical profession of New York city. He thought they had been very shabbily treated, but that in the near future they would be better appreciated. Certainly the work of our board of health had apparently been appreciated more abroad than here. The work of the New York Board of Health had been an object lesson to the world.

In conclusion, he said that the American Pædiatric Society now assumed that antitoxine had come to the third stage, or that of acceptance, and that it was now a

question merely of what percentage of recoveries could be obtained in the worst class of cases in private practice in the United States and Canada. He hoped that the collective investigation this year would receive the hearty support of the medical profession at large.

Dr. H. F. Koester said that he was one of the inspectors of the health department. He had seen many cases, and the type of diphtheria had been generally severe, for the cases had usually been first seen at a late stage. Many of them had been croup cases. He had been frequently asked regarding the manner of making the injection, the dose, and the results. The inspectors had been called to cases by police telegram, and had responded promptly at all hours of the day and night. The antitoxine treatment had been carried out by the health board inspectors without any interference with the treatment of the attending physician. After having given the antitoxine injection, a visit would be made at the end of twenty-four hours, and sometimes another injection would be given at that time. It had been his custom to inject at least twenty-five hundred units at the start. Where the mothers would consent, he would immunize the other children. For children that could not be properly isolated it seemed to him both safe and desirable to use larger doses than had been generally recommended for immunizing purposes. With reference to croup cases, he believed the dose should be still larger—three thousand to thirty-five hundred units for the initial dose—and that on the next day another injection should be given. Many physicians seemed to think that antitoxine would prevent laryngeal stenosis, but this was not true. On the contrary, it had seemed to him sometimes that it had tended rather to increase the stenosis for twenty-four hours, after which the membrane would become thinner and the respirations easier. If the tube was already in place at the time of the injection it could be removed, as a rule, much sooner than formerly when antitoxine was not employed. He had never seen any bad results from antitoxine, whether used in curative or immunizing doses. He also had noticed a vacillation of opinion, apparently dependent upon the criticisms that had been made in the papers or at the medical meetings. Some physicians who had formerly called upon him early for antitoxine, had later on waited for many days, seeming suddenly to think that the antitoxine was not necessary. He believed that antitoxine was a specific for diphtheria, and that it should be used as a specific. By this he meant

that the medical treatment, instead of including the administration of iron, bichloride, etc., should consist only in the administration of a heart tonic, such as strychnine or glonoin. The throat and nose should be irrigated with boric-acid solution, or with a neutral solution of hydrogen dioxide in the proportion of 1 in 3 of water. His last report to the health department had comprised ninety-three cases, with two deaths. There had been twenty-five laryngeal cases, in five of which the patients had been intubated, and all had recovered.

Dr. William J. Pulley referred chiefly to his work with the board of health. He said that he had injected in 389 cases of throat trouble. If a culture had not been made on his arrival, and the clinical picture had closely resembled diphtheria, it had been his custom to inject the antitoxine, and then make a culture. In 376 of the cases the culture had contained the Klebs-Loeffler bacilli, or the bacilli had been enough like the Klebs-Loeffler bacilli to warrant the conclusion that the case was one of true diphtheria. Of these 376 patients, 15 had been either sent to the hospital, or had refused further treatment, so that they could not be followed. Out of 361 cases, therefore, that had been followed, 303 patients had recovered and 58 had died, giving a mortality of sixteen per cent. Of the 58 that had died, 11 had been moribund when first seen, and they had only been injected at the urgent request of the family or the attending physician. Of these 11 moribund patients 5 had died from suffocation and 6 from sepsis, or profound diphtheritic toxæmia. Of the 361 cases of diphtheria 82 had been laryngeal, and 23 of the patients had died, giving a mortality of about twenty-eight per cent. Of the 23 that had died 5 had been moribund at the time of the injection. Excluding these, the mortality had been 21.9 per cent. Excluding those of the moribund, there had been 77 laryngeal cases treated with antitoxine, only 10 of which had been operative cases. Four out of the 10 patients in these operative cases had died. Of the 66 patients not operated on, 14 had died, giving a mortality of 20.8 per cent. The majority of these non-operative cases had been of a severe type. The general treatment had been with the tincture of the chloride of iron, chlorate of potassium, sometimes with bichloride of mercury; irrigations of the throat had been used very seldom, sprays very often. In the majority of cases the children had been thoroughly steamed under a tent.

In 13 out of 389 patients injected no Loeffler bacilli

had been found, and of these, five had died. Four of them had had severe attacks of scarlatina. Two had died of sepsis and two of uræmia. The fifth, a child about fourteen months old, had had an extensive membrane over the tonsils, uvula, pharynx, and posterior nares, with a great deal of glandular swelling, and a temperature of about 104° F. Two different cultures had been made from this child's throat, and in neither had the Loeffler bacilli been found, but instead there had been a large number of streptococci. This case had appeared clinically to be one of diphtheria, and the patient had received an injection of about six thousand units. The speaker had noticed particularly that the antitoxine had no effect upon the membrane in this case, or upon the patient. The child had died from exhaustion two or three weeks after the last injection.

The number of persons that he had immunized up to November 1, 1896, was a hundred and sixty-three. Four of these had had diphtheria after immunization—one in seven days, one in ten days, and two in three weeks. The last two had been in the same family, and under the most distressing sanitary surroundings. At that time he had been using small immunizing doses, but after these cases he had made it a rule not to give less than two hundred and fifty immunizing units to children over six months of age with such bad surroundings. Every one whom he had immunized had been exposed to one or more cases of diphtheria. He had invariably injected the antitoxine into the lumbar region. The curative dose had always been fifteen hundred units or more, even in a mild case of diphtheria. For a severe case he would give from twenty-five hundred to three thousand units. He had made six hundred and sixty-one injections of antitoxine, and after none of these had there been any symptom of any moment. Usually the rashes alone had caused trouble. In two cases there had been abscesses—both in the same family, and both in children with very filthy skin.

Dr. Floyd M. Crandall said that the statement made in the paper, that although the number of antitoxine units administered was being increased the number of cases of rashes was diminishing, would seem to indicate that these bad symptoms were probably due to imperfections in the serum rather than to the antitoxine itself. Last winter he had had an opportunity of watching the effect of antitoxine in two cases of congenital cardiac disease—one of them in a very blue

child of four years. This child had received two thousand units of antitoxine, and had shown no effect on the heart whatever. Both children had made a good recovery. It seemed to him that the tables of statistics presented, especially those of absolute mortality, were especially convincing. Dr. Biggs deserved the thanks of the society for bringing them forward.

Dr. Joseph E. Winters said that if antitoxine accomplished the remarkable results that had been alleged for it, he would like to know why it was that such a man as Dr. Francis Huber, who probably came into close contact with more cases of diphtheria than any one who had spoken to-night, should have been compelled to give up antitoxine after a very careful trial. He had given up its use because of the results obtained. Without antitoxine he was now getting most excellent results. In laryngeal operative cases he had secured just as good results as those reported by the American Pædiatric Society committee from the use of antitoxine. If antitoxine did all that had been alleged for it, why was it that Dr. John Dorning, in seven successive cases of diphtheria in private practice, treated with antitoxine in the very beginning of the disease, had lost every one of the patients? And why should Dr. Alexander Dallas, of Bayonne, an old Scotchman, and a shrewd practitioner of large practice, have lost with antitoxine ten patients in eleven consecutive cases? Why should Dr. Smith, of Newark, a man who had been in practice for twenty-two years, and who was the leading practitioner of his city, give up the use of antitoxine if it did all that had been alleged for it to-night? He had just received a letter from Dr. Haggerty, who stated that he had been compelled, along with Dr. Huber, to give up the use of antitoxine. If it had done all that had been alleged for it, why was it that Dr. W. Dayton, of London, who had lived in the midst of diphtheria for thirty years, and who, as the senior member, had signed the report favoring the use of antitoxine in the London hospitals, had refused to have it used upon himself when he had been stricken with the disease? He now had in his pocket a letter from Dr. Dayton, stating that he was recovering from diphtheria, and that he had post-diphtheritic paralysis As he had failed to state whether or not antitoxine had been used upon him Dr. Winters had asked Mrs. Winters to call upon him and inquire as to this point. His reply to her had been: "No, I would not have antitoxine used on me if I were

to die of diphtheria." Again, why should Dr. William M. Welch, of Philadelphia, who probably had had a more intimate knowledge of diphtheria than any man in America, having had entire charge of the Municipal Hospital there for over twenty-five years, state positively that he would not have antitoxine used upon himself under any circumstances?

With reference to the statement made about the time of wearing the tube being shorter than before antitoxine was used, he would say that Dr. Welch had stated to him the other day at the Willard Parker Hospital that the average time of wearing the tube in the Municipal Hospital under the antitoxine treatment had been ten days, while before that the average time had been five or six days.

With reference to the statements made about the actual mortality—*e. g.*, that the mortality of Paris at the present time was about one third what it had been in previous years—he would say that in the files of the *Lancet* would be found recorded only three deaths in the city of Dublin from diphtheria since one year ago last June. For over a year there had not been a death from diphtheria in that city, yet antitoxine had not been used there. A few years ago, in Boston there had been two hundred and twelve deaths from diphtheria in one year, yet in the next year there had been eight or nine hundred deaths—a greater variation than in Paris with antitoxine. Dr. Adolph Rupp had stated to him recently that formerly cases of laryngeal diphtheria had steadily progressed under any treatment to intubation, and in some cases still further to tracheotomy, while at the present time in the same cases, so far as could be determined clinically, the patients got well under the same treatment without any operative interference. It was again the old question of the character of the epidemic.

In connection with the statement that the mortality was so very low in operative cases under antitoxine treatment, he would simply refer to a recent case in which Dr. Burton had made a diagnosis of diphtheritic croup, and had insisted on the use of antitoxine. Instead, Dr. W. L. Stowell had been called, and suspecting it to be a case of catarrhal croup, had ordered a dose of castor oil and the application of poultices. The patient had recovered in forty-eight hours.

It was entirely a question of the character of the epidemic, and a report which covered thousands of cases, indiscriminately collected from all parts of the world,

was certainly of no value to any one who had seen anything of diphtheria. The material must be studied carefully in all diseases, particularly in the infectious diseases. It seemed to him that we could not get at the truth until all bias had been eliminated, and until everything that came along that was possibly diphtheria had been subjected to the antitoxine treatment. Dr. Stowell had told him that a health-board inspector had refused to inject a number of patients at Randall's Island because he said it would injure the statistics, and Dr. De Kraft had made a similar statement to him. Dr. Welch had stated that in the majority of cases in Philadelphia, which were clinically unquestionably diphtheria, a negative culture would be obtained, but that in these same cases after the throat had entirely cleared and there was no evidence of the disease, the laboratory would find positive evidence of diphtheria. This had been the rule there. Last year there had been two persons sent to Bellevue Hospital for treatment for diphtheria, with a bacteriological diagnosis of diphtheria, yet they had turned out to have nothing but syphilis.

Dr. Biggs said that in reply to Dr. Winters's question he would simply ask another question—*i. e.*, why there were antivaccination societies in this country, and antivaccinationists all over England, and why they had had an epidemic of small-pox in Gloucester last year due to the agitation of the antivaccinationists, and the consequent lack of vaccination of the inhabitants, which had finally required the intervention of the local government board of Great Britain to stamp it out. Again, he would ask Dr. Winters why he found it necessary to describe these men who were opposed to antitoxine. If they were distinguished physicians, it would not be necessary to tell what extensive experience they had had. It was not necessary to describe Welch, or Osler, of the Johns Hopkins University, or Janeway, or von Ranke, or Baginsky, or Roux, or Koch, or one hundred and fifty more men of that stamp. Dr. Winters's associates, however, did need such description. It seemed hardly necessary to say that when a collection of twenty-five thousand cases, derived from one hundred and fifty reports, formed the basis of a medical paper, the reading of which could not occupy more than forty or fifty minutes, it was impossible to give the references and data; but they were all there, nevertheless, and would be published in the official bulletin of the health department.

The reference to specific cases in a matter of this

kind—such as one case of supposed diphtheria turning out to be syphilis, or another case showing diphtheria bacilli turning out to be something else, or a case of supposed diphtheria turning out to be one of catarrhal croup and the patient getting well after a dose of castor oil—made the task of replying a hopeless one. These cases should be contrasted with the reports of about fifty thousand cases from the best clinical observers throughout the civilized world. He believed there was not a professor of the diseases of children in any university in Germany or Austria whose name was not on the list of those favoring antitoxine, and he would hold this list up in contrast to the names mentioned by Dr. Winters.

Meeting of January 6, 1897.

The President, Dr. Lucius W. Hotchkiss, in the Chair.

Osteo-sarcoma of the Superior Maxilla.—Dr. J. W. S. Gouley exhibited a patient from whom he had removed the right upper maxilla for osteo-sarcoma, with the following history:

J. M., twenty-one years of age, had been admitted to Bellevue Hospital on the thirty-first day of October, 1896, in good general physical condition, but having a tumor involving the right malar and superior maxillary bones, which had begun soon after the reception of a blow, in the right zygomatic region, from a stone, about four inches in diameter, flung in play by a boy two years prior to the patient's admission to the hospital. The immediate effects of the contusion had not been perceptible two weeks later. Shortly after this he had noticed some tumefaction, which had slowly but steadily increased, and had finally involved the whole superior maxillary bone and about one fourth of the malar. At no time did the tumor cause pain, and it had not been tender under pressure. During the three weeks prior to his coming to the hospital he had thought that the growth was increasing at a more rapid rate than before, and on this account had sought medical advice. The right cheek had then been unduly prominent; the orbital plate had appeared to be so much raised as to cause some extrusion of the eye, the sight of which had been a little impaired; the nasal process had been decidedly enlarged, half of the

hard palate had been depressed from thickening of the bone, and the alveolar process had bulged to an inordinate degree.

Removal of the tumor was advised and effected on the 10th of November, 1896. The patient having been etherized, a preliminary tracheotomy was performed, and anæsthesia continued through the tracheal tube. The pharynx and larynx were closed by means of a sponge. A curvilinear incision down to the bone was made along the edge of the orbit, and a second incision vertically from below the inner canthus of the lids to and through the upper lip. The flap thus made was dissected as far outward as the body of the malar bone, preserving the labial mucous membrane and the part thereof reflected upon the alveolus. A longitudinal incision was made through the soft parts over the hard palate about a quarter of an inch to the right of the median line, extending from the palate bone forward, and a transverse cut across the posterior edge of the palatine process of the superior maxillary. The right incisor tooth was extracted and the anterior part of the maxilla divided along the median line by means of Isaacs's bayonet-shaped bone forceps. With the same instrument the malar bone was cut close to its articulation with the jaw and also in part the nasal process through its base. The chisel and mallet served to loosen the bone, which was then grasped and detached with Farabeuf's forceps. A few sections with the scalpel were sufficient to divide the buccinator, masseter, and external pterygoid muscles close to their attachments, when the whole bone, together with a part of the malar, the palate, and inferior turbinated bones, was removed from its bed. The soft palate was intact. Nearly all of the remainder of the nasal process and the adjoining part of the malar bone were removed by means of a gnawing forceps. The hæmorrhage, which was not great, was controlled by quick seizure with artery clamps of the bleeding vessels, which were leisurely tied with catgut. The subsequent oozing was stopped with hot sponges. The flap was stitched with catgut and the wound cavity packed with sterilized gauze. The tampon tracheal tube of Gerster was replaced by a double tube. The external wound having healed primarily, the packing was renewed on the third day. Liquid food was administered by the rectum for three days and then by the mouth with the aid of a catheter passed into the pharynx. There had been comparatively little febrile reaction during the progress of the case, the temperature having risen to 102.8° on

the day of the operation and on the fifth day. On the seventh day the tracheal tube was removed. On the eighth day the patient sat up. He began to take fluid food in the natural way on the ninth day. The wound cavity had continued to be lightly packed every day for two weeks and had been rapidly decreasing in dimension. The tracheal wound had been completely closed in three weeks from the date of the operation. The sight of the right eye had been restored soon after the operation. The preliminary tracheotomy had been of the greatest assistance in the operative procedure, and the pharyngeal sponge had prevented the swallowing and inspiration of blood. Thirty days after the operation the patient had been fit to leave the hospital, had been able to speak with fair distinctness, and had again been in good physical condition. How soon the growth might recur remained for future observation. At this time, fifty-seven days since the operation, the cavity was lined with granulation tissue and was still contracting. The facial deformity was slight.

Examination of the excised jaw, which was exhibited, showed the bone to be much increased in size and weight, and a typical example of compact osteo-sarcoma. The teeth were in good condition. The third molar was missing and probably had not come through. The alveolar process over the incisor, canine, and bicuspid teeth bulged so inordinately as to obliterate the incisive and canine fossæ. The infra-orbital foramen was half an inch below the margin of the orbit. This margin was rounded and thickened and the muscular attachments of the region were displaced downward. The posterior surface of the bone was much more convex than normal. The maxillary tuberosity was firmly ankylosed to the tuberosity of the palate bone. The orbital surface extended much farther posteriorly than in the normal state. The infra-orbital groove had disappeared, while the infra-orbital canal was of normal calibre, but increased in length. The vertical process and the orbital plate of the palate bone were ankylosed and lost in the new growth. The palatine process was greatly thickened and ankylosed to the horizontal plate of the palate bone. The antrum was nearly obliterated by the new growth, which left only a narrow slit along the inner wall of the cavity. What appeared to be the maxillary fourth of the malar bone was much increased in thickness and lost in the new growth. The jaw, minus its nasal process, after being deprived, by steaming, of the soft parts, weighed,

when dry, twelve drachms and a half, or more than twice the weight of the normal bone. The greater part of the detritus resulting from the use of the gnawing forceps had been lost. The inferior turbinated bone was solid and hard. The volume of the bone was unchanged, the increase being interstitial. It weighed, when dry, thirty-one grains, or more than six times the normal weight. The bones were of a yellowish tint, which was retained even after drying.

Microscopical examination of the bone, after decalcification and section of small portions of it, had revealed a great abundance of small spindle cells, a few round cells, and very few giant cells. The stained sections had been compared with two other specimens of decalcified osteosarcoma through the kindness of Dr. Jeffries. In these other specimens, one of which had been removed by Dr. Abbe, there were many giant cells, and the spindle cells were large, while in those from J. M.'s jaw the giant cells were few and the spindle cells many and small.

Paper.

SERO-DIAGNOSIS OF TYPHOID FEVER. A STUDY OF ITS PRACTICAL CLINICAL VALUE, WITH A DEMONSTRATION OF THE BLOOD REACTIONS.

By JOHN WINTERS BRANNAN, M. D.,

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Six months have now passed since Widal first proposed and described a new method of diagnosticating typhoid fever by means of an examination of the blood. During this period many clinicians and bacteriologists have repeated Widal's observations, and their published reports, so far as I have seen them, have all confirmed his conclusions as to the value and accuracy of the serum test. Early in November last the subject was brought to the attention of the physicians of New York by the action of the board of health, who offered to examine the blood of all cases of suspected typhoid fever occurring in either private or hospital practice in the city. Having at that time a number of cases of the disease in my service at Bellevue Hospital, I thought it an excellent opportunity to study the new test, especial-

ly as I had the aid of a zealous and most efficient house staff, that *sine qua non* of all good hospital work. Indeed, if I remember rightly, it was at the suggestion of Dr. Humphreys, the house physician of the first medical division, that we decided to provide ourselves with the apparatus and broth cultures necessary to performing the test ourselves. At the same time, we availed ourselves freely of the assistance so kindly offered by the bacteriologists of the health department. Careful records were kept of our investigations, as it was my intention at the time to present a report of our work to this society. In order that the principles underlying the test may be fully appreciated, I shall also give a short account of the experimental observations which paved the way for the discovery of Widal, as well as some consideration of the nature of the substances in the serum which produce the reaction.

Chantemesse and Widal were among the first experimenters in this field. In 1888 they succeeded in immunizing animals against the typhoid bacillus by injecting them with sterilized cultures of that bacillus. These observers found later (in 1892) that the same result could be accomplished by means of the serum of patients suffering from typhoid fever or convalescing from that disease. Then followed the observations of Pfeiffer and Kolle, who showed that the serum of typhoid convalescents or the serum of immunized animals, when injected into the peritoneal cavity of guinea-pigs at the same time with a virulent culture of the typhoid bacillus, had the property of immobilizing, agglutinating, and rapidly disintegrating the bacilli in the serous fluid. This reaction is generally known as "Pfeiffer's phenomenon" or reaction. The same serum, injected in like manner with cultures of the colon bacillus, had no such effect, the bacilli remaining isolated and motile. Later, Gruber and Durham observed the same immobilizing and agglutinating action upon typhoid bacilli outside the animal body, the mixture being made *in vitro*. There was no action upon the colon bacillus in any of its varieties. Again, Pfeiffer and Kolle

showed that if the serum of immunized animals was added to bouillon in certain proportions, and the bouillon was then sown with typhoid bacilli, there resulted, after twenty-four hours, a clear fluid with the bacilli precipitated at the bottom of the tube collected into small clumps. Colon bacilli, sown in the same bouillon, caused the usual clouding and preserved their motility. Pfeiffer and Kolle therefore recommended this procedure as a means of distinguishing between the typhoid and the colon bacilli. Widal carried these last observations one step farther, and found that the serum of typhoid patients had on cultures of the typhoid bacillus the same agglutinating action as the serum of animals immunized against typhoid fever. The serum of healthy individuals, on the other hand, or of persons suffering from diseases other than typhoid fever, had no such property. Having arrived at this point, Widal had only to reverse the terms of the problem and ascertain how the blood serum of a given individual acted upon a culture of the typhoid bacillus. If the addition of the serum produced immobilization and clumping of the bacilli in the culture, the individual had typhoid fever or had recently recovered from the disease. If the bacilli were unaffected, typhoid fever could be eliminated from further consideration.

The nature of the agglutinating substances in the serum is an interesting subject of speculation and study. It appears that various fluids and secretions of the body possess the agglutinating power to a greater or less degree. It is very marked in the fluid of blisters. It has been found in the tears, also in the fluid of the pericardium, peritonæum, and pleura. It is sometimes present in the urine, but not constantly. The action was very marked in the milk of a nursing woman suffering from typhoid, but was not found in the blood of the infant nursed by the woman. The aqueous humor of immunized rabbits gave the reaction in five cases out of nine. Experiments by Widal seem to show that the power is exerted by the fibrinogen and globulin of the blood, but is wanting in the albumin. On analyzing the

milk of immunized goats, the power was found in the lactoglobulin, also in the casein, but was absent in the lactalbumin. Removal of the albuminoid substances, fibrinogen, globulin, and casein, from the body fluids of a case of typhoid fever, removes the agglutinating power from those fluids. According to Pfeiffer, the agglutinating substances are not antitoxines, but are bactericidal bodies, of the nature of ferments, in active and inactive form in the serum. Nothing is known as to the origin of the bactericidal substances, but Pfeiffer maintains that the leucocytes have no part in the process. Other observers have shown that if the immunizing serum be heated to a certain temperature it loses its bactericidal action without losing its power of agglutinating the typhoid bacilli. It is evident, therefore, that this special reaction is not dependent on the bactericidal property of the serum, but is due apparently to the presence of so-called protective bodies, and it is generally accepted that these protective bodies, the alexines of Buchner, are present to a greater or less extent in normal blood serum. Gruber not only believes that protective bodies are found in normal serum, but maintains that these bodies are the direct agents in killing the bacteria which enter the body. In his opinion, the specific substances which result from immunization simply aid the bactericidal action by destroying the outer covering of the bacteria, thus laying them open to the attack of the alexines of the normal body. Pfeiffer also, early in his experiments, found that normal human serum, in doses of three to eight decigrammes, exerted a protective action in guinea-pigs of three hundred grammes weight, counteracting the effect of a fatal dose of typhoid bacilli. He holds, however, that the protective action of normal serum and that of serum from typhoid convalescents are not the same; the former simply immobilizes the bacilli and prevents their increase, if given in adequate dose; the latter destroys the bacilli by causing their dissolution or disintegration. There is, therefore, a qualitative as well as a quantitative difference in their action. It is evident

from the foregoing statements of various observers that normal blood serum contains substances which act strongly upon bacteria when the latter are introduced into the body. In the case of the typhoid bacillus they are able to at least hinder its growth and activity, if not to destroy it. It remains to be seen whether this action is ever exerted outside the body when the serum and the bacillary culture are brought together in certain proportions.

Before proceeding to recount our own experiments I must refer to some recent observations of Courmont's, as they go to prove that the Pfeiffer phenomenon or reaction is not of universal application. Courmont experimented with the serum of nine typhoid patients and found that it invariably gave a positive reaction with cultures of the typhoid bacillus; but it also reacted with the colon bacillus, sometimes very markedly. It also gave a distinct reaction with cultures of the Loeffler bacillus and of the *Staphylococcus pyogenes aureus*, but did not affect the *Bacillus pyocyaneus* or the *Streptococcus pyogenes*. The serum of patients affected with diseases other than typhoid fever had no action on the typhoid bacillus. Courmont therefore concludes that a culture of the typhoid bacillus can be used to determine whether or not a given specimen of blood has been taken from a patient suffering or convalescing from typhoid fever—the test of Widal—but he also believes that the fact that the serum of a typhoid patient reacts upon a given bacillus does not prove that the latter is the bacillus of typhoid.

There are various ways of performing the test of Widal, but the principle is the same in all. As already indicated, the test consists in adding human blood serum in certain proportions to a recent culture of the typhoid bacillus, and noting the effect upon the motility and arrangement of the bacilli in the mixed fluid. The culture * should be only eighteen to twenty hours old in

* The cultures employed in these experiments were made from laboratory stock cultures which had not been transplanted for some weeks. I note this fact because Dr. Wyatt Johnston has suggested that

order to get the best results, the bacilli then being in active motion and the broth free from clumps. When sufficient fresh blood can be obtained to give pure serum for the test, the mixing proportions should be one part of serum to ten of the culture fluid. When dried blood is used, one part of serum to three or four parts of culture gives the best results, in my experience. Whatever proportion is adopted should be adhered to, in order that the resulting reactions may always have the same significance. In most of my work I have used dried blood taken from the finger with aseptic precautions. In two cases marked reactions were obtained from the fluid of blisters. The drop of dried blood should be dissolved with a drop of sterilized water, and the fibrin and coloring matter allowed to settle. With a platinum-wire loop four small drops of the culture are placed upon a clean cover glass which has just been passed through the flame. One drop of the clear upper layer of blood serum is then taken and mixed with three of the drops of culture, the fourth drop being left as a control. The cover glass is then inverted over the hollow cell of a glass slide and sealed with oil or vaseline. The hanging drop may then be studied with a quarter or one sixth objective. I regard it as important to have a control drop on each cover glass side by side with the specimen. It is often desirable or necessary in cases of slow or doubtful reaction to turn to the drop of pure culture and see what changes are taking place there. The method of using dried blood and then redissolving it with water necessarily gives a serum of very uncertain strength. In the majority of cases the reaction is so clearly positive or negative that this rough method answers our purpose. In all doubtful cases, however, I should recommend the use of a blister. The blister fluid can be aspirated in small glass capillary tubes and obtained pure and then diluted to any required strength. Its freedom from fibrin and blood coloring matter is

the false reactions reported by some observers were probably due to the use of stock cultures which had been made active and virulent by frequent (daily) transplantation.

also an advantage. The blister can be made with cantharidal collodion or plaster and causes but trifling pain, as I can state from personal experiment.

The reactions which are observed in the mixture of serum and culture are generally described as either positive or negative, but, in my opinion, a considerable proportion can only be called "doubtful" or "partial." When most of the bacilli are immobilized and formed into clumps within five or twenty or thirty minutes, and the others have either lost their motility or retain simply a sluggish, uncertain movement, the reaction is properly classed as positive, or marked, or typical typhoid. On the other hand, if the activity of the bacilli persists and there is no clumping whatever, the reaction is naturally negative. But in many cases the motility of some of the bacilli is impaired while others remain active. There may also be some loose clumps, but the bacilli forming the clumps may still be in motion. It is, therefore, often impossible to call the reaction anything more than "doubtful." I shall have occasion this evening to describe actual instances of these various forms of reactions, and they will also be demonstrated under the microscope.

The cases forming the subject of our experiments may be divided into three groups. The first and second groups comprise cases which had been under my own observation or with whose clinical history I was familiar before the examination of the blood was made. The third group is made up of cases of which I knew nothing at the time the specimens of blood were sent to me.

In Group I are included fourteen cases of individuals suffering from typhoid fever or recently convalescent from the disease. In nine of the cases the blood was tested during the active period of the disease, in one case as early as the eighth day. The reaction was marked in all but one of the nine cases. The case which gave the reaction on the eighth day was a striking instance of the value of the test. The patient was a boy twelve years of age, who had been ill for a week with fever, cough, malaise, pain, and stiffness in the

muscles of the neck, and slight diarrhœa, which had been apparently excited by a laxative given at the beginning of his illness. I was called to see him at his home in a tenement house. He had a temperature of 101°, a slight cough, and the signs of bronchopneumonia of the right side, but complained principally of the pain in the neck. There were no rose spots, but I thought I could feel the spleen. I examined some of his blood, and the reaction was so marked that I had him sent at once to the hospital. His disease proved to be typhoid of a rather mild type, and the blood gave a positive reaction as long as he remained under observation. I have here a dried specimen of his blood, which still responds to the test, though it was taken from the finger over four weeks ago. I saw the patient to-day, two weeks after he left the hospital, and find that his blood now reacts less than the old dried drop of four weeks ago.

Another case in which the test proved of value was that of a patient who had been in the hospital for eight days without our having been able to arrive at a positive diagnosis. The patient entered the hospital on the 2d of November with a history of a three weeks' illness, sudden in its onset. His condition on the day of entrance suggested typhoid fever, but his symptoms during the next few days were not what one would look for in the fourth week of the disease. On the 10th of November some of the blood was sent to the board of health for examination, and a marked reaction was reported. The further course of the disease sustained the diagnosis of typhoid fever, and repeated tests of the blood gave uniformly a positive result. It is probable that in both of these cases a diagnosis would ultimately have been made from the clinical signs, but the blood-serum test saved us several days of uncertainty.

One case only of the nine, in a private patient of Dr. Henry W. Berg's, has given an absolutely negative reaction, though the blood has been examined four times from the tenth to the twenty-second day of the disease. The other six of the nine active cases were well advanced when the blood examination was made, and the

positive result of the test simply confirmed the previous diagnosis. The dried blood of two of these cases, taken from the finger some seven weeks ago, still gives a marked reaction.

In the remaining five cases of Group I the test was not made until convalescence was established. In three the result was positive, the interval since recovery from the fever being two months in two cases and ten months in the third. The two negative cases were examined after an interval of five months in one case and sixteen months in the other.

Group II includes forty-eight cases of individuals either in good health at the time of the serum test or suffering from diseases other than typhoid fever, such as lobar pneumonia, malarial fever, tuberculosis, chronic nephritis, cirrhosis of the liver, puerperal sepsis, eclampsia, acute mania, melancholia, alcoholism, leprosy (three cases), scarlet fever, diphtheria, acute rheumatism, diabetes (three cases), as well as various minor ailments. The great majority of these cases failed to react at all to the serum test. In three, however—all patients in Bellevue Hospital—there was a partial reaction, never complete and unmistakable, but still as marked as is sometimes obtained in typhoid fever. The first of these doubtful cases was that of a negro named Chase, with cirrhosis of the liver and ascites. He stated that he had had no fever of any kind during his twenty years' residence in New York. His blood has been examined repeatedly, sometimes with negative result, at others with a doubtful reaction. The two other patients were also of the African race, one with nephritis, the other, in a woman, with puerperal sepsis. Only one test was made in each case. Three other negroes in the hospital gave no reaction.

Thinking that perhaps negroes were more or less immune to typhoid fever, I went last week to the Colored Home and Hospital, and with the kind assistance of the superintendent, Dr. Bickerton, I obtained blood from twelve of the patients. One only, however, of the twelve gave a moderate reaction, a patient with diabetes.

I was told by Dr. Bickerton that they had not had a case of typhoid fever for fifteen years. But this may be partly due to the fact that patients with acute disease are rarely brought to the hospital, owing to the lack of an ambulance service. In my own experience in New York I do not recall a case of typhoid fever in a negro of pure blood. I have consulted the United States Census tables, as well as the reports of the Charity Hospital in New Orleans, and have found a somewhat lower rate of mortality from typhoid fever in the colored race than among the white population.

There were thirty white persons in this group and not one gave a positive reaction to the test, with the exception of a patient with necrosis of the tibia, who had had typhoid fever one year previously. Four of these persons were individuals who had had a fever of uncertain character a few months before the examination of the blood. The test was made in their cases in order to determine whether or not the previous illness had been typhoid fever. Had the result been positive, it might have been taken to indicate that the previous disease was typhoid in character; but the negative result can not be said to absolutely exclude typhoid fever, in view of the possible rapid disappearance of the agglutinating bodies in the blood, as shown by the result of some of the tests in the convalescent cases in Group I.

The greater part of the cases in the two groups just considered were those of patients in Bellevue Hospital, and they were examined during the month of November, when Widal's test was new to all of us in New York. In addition, as I have said, the clinical features of the cases were known before the blood was tested, and it is impossible, in work of this kind, not to be somewhat influenced in one's judgment of a doubtful reaction by previous knowledge of the case. I must add, however, that all of the typhoid-fever cases, as well as the doubtful cases among the non-typhoid patients, were passed upon by Dr. William H. Park, and his results were the same as those given above. The only undoubted typhoid case which failed to give a marked reaction was the case of Dr.

Berg's, and that case is still under observation. By good fortune I happened to preserve the dried blood of four of the other eight active fever cases, and the reaction may still be observed. I have also the original specimen from the first negro that gave a doubtful reaction, and it is interesting to note that it fails now to react at all to the test.

At this point in my investigations it occurred to me that it would be well, as a sort of control to the above observations, to apply Widal's test to the blood of persons whose clinical history was unknown to me. Dr. Frank W. Jackson, who succeeded me in the service at Bellevue Hospital on the 1st of December last, has kindly aided me in this plan, and, thanks to him and to the house staff of the first medical division, I have received from thirty to forty specimens of blood taken from selected patients in their wards. My third group is composed of these cases, and of a few others obtained from different sources. With very few exceptions, all of the specimens were submitted to the judgment of Dr. Park, who not only is an expert bacteriologist, but has also had more experience in the serum diagnosis of typhoid fever than any one else in New York. My object was not to test my qualifications in this new line of research. My experience during the month of November had convinced me that it was not advisable for the practising physician to pursue this method of diagnosis at the bedside. I wished to ascertain whether, with the aid of a bacteriologist, the clinician could determine whether or not he was dealing with a case of typhoid fever in the absence of the usual signs of that disease.

It is not necessary to describe in detail all the observations included in our third group of cases. I may say at the outset that in the main the clinical and the bacteriological diagnosis were in agreement. In Group I we have seen that one patient out of nine with typhoid fever failed to respond to the Widal test as late as the twenty-second day of the disease. In Group II, of forty-eight cases which were not typhoid in nature four gave a partial reaction. In Group III, in addition to sev-

eral instances of doubtful reaction there are three cases in which the result of the serum test has not supported the clinical diagnosis. One case (Lang's) of well-marked typhoid fever has repeatedly failed to react to the test though it is now in the fifth week of the disease. Daily examinations of the blood have been made, and the reaction has been negative or doubtful throughout. Another case (Durphey's), which has not a single typhoid symptom, has given a marked reaction from day to day during the past two weeks, the first examination three weeks ago having been negative. I have brought specimens to-night of the blood of both of these patients, and I find myself in the rather novel position of showing the so-called typhoid reaction with normal blood serum, and, on the other hand, of demonstrating the failure of the reaction with the blood of a typhoid patient. An interesting feature of the first case (Lang's) has resulted from the fact that three days ago we were able to obtain some blood from the spleen, and Dr. Park has succeeded in isolating the typhoid bacillus from a culture of this blood. The case, therefore, is bacteriologically, as well as clinically, typhoid fever, in spite of the failure of the test of Widal. A third case, non-typhoid, gave a marked immediate reaction on one day, the 19th of December, but has been negative ever since. It happened that he, as well as Durphey, had been given thirty grains of quinine on that day some hours previously to the taking of the blood. As this was the first occasion on which Durphey had reacted positively, it was thought that possibly the reaction in both cases was due to the quinine. The drug was therefore given to six patients as an experiment, but the blood was apparently unaffected in any of the cases. I must not neglect to add that both Durphey and Bucklander are negroes.

In order to test the bacteriological accuracy of the serum test when performed by competent men, I sent last week to four well-known bacteriologists of New York specimens of blood taken at the same time from three different cases. I selected for this purpose Chase,

the negro with cirrhosis of the liver; Durphey, the non-typhoid case with typhoid reaction; and Lang, the typhoid case with negative or doubtful reaction. The specimens were simply numbered, with no clew to the nature of the cases. I have received three reports in reply, and the results are the same in all. Chase is returned as "negative," Durphey as "positive" or "typical typhoid," and Lang as "doubtful" or "imperfect" reaction.

I shall quote in full one of these reports as an illustration of the care and thoroughness that are exercised in this sort of work.

The tests were made with a twenty-four hours' growth of Eberth's bacilli on agar—bacilli very motile and evenly distributed through hanging drop. Results noted at intervals as recorded below:

Specimen B. H. 31 (*this is the case of Lang*). *Examination No. 1.*—Five minutes: Bacilli very motile, and no evidence of agglutination.

Fifteen minutes: Motility somewhat diminished, but no well-marked clumping.

Thirty minutes: Some of the bacilli motionless and formed in loose clumps with bacilli in slight motion. Free bacilli very motile.

Sixty-five minutes: Clumping more marked, but bacilli forming the clumps are not entirely motionless. Some of the clumps not stable, and when clump breaks up majority of bacilli are very motile.

Forty-eight hours: Bacilli motile where free. In portions of drop some loose clumping.

Same Specimen. Examination No. 2.—In this examination a smaller amount of water was added to dried drop of blood and more of serum added to diluted culture.

Five minutes: Bacilli not as motile as in control specimen; scattered through the field, three to eight bacilli in loose clumps, and motionless. Free bacilli motile.

Fifteen minutes: Motility of all the bacilli impaired, and the loose clumps of bacilli more numerous.

Forty-five minutes: No change in reaction.

Twenty-four hours: Bacilli have very little motion.

Arrangement of clumps same as above.

Conclusions.—Would not consider the reaction *typical* of typhoid. When the strong serum was used it would be classed as doubtful or "imperfect" reaction.

Specimen B. H. 39 (this is the case of Chase). Examination No. 1.—Conditions same as for B. H. 31, examination No. 1.—Five minutes: Very active. Motility seemingly increased; no attempt at agglutination.

Fifteen minutes: Motility equals that of control specimen; no attempt at agglutination.

Thirty minutes: Motility markedly impaired; no clumps formed.

Sixty-five minutes: Some of bacilli are motionless, in others there is diminished motility. Some aggregation of bacilli, but can not be called "clumping."

(Control specimen showed no change at this time.)

Same Specimen. Examination No. 2.—Conditions same as B. H. 31, examination No. 2.—Five minutes: Some loss of motility, but no clumping.

Fifteen minutes: Marked loss of motility, but no clumping.

Thirty-five minutes: Motility same as above, and a few bacilli loosely collected together, but not entirely motionless.

Sixty minutes: Many of bacilli motionless, lying free in drop; others motile in but a slight degree. Some small groups of bacilli are motionless, but can not be considered agglutinated or clumped.

Two hours: Same as above stated. Reaction negative.

Specimen B. H. 35 (this is the case of Durphey).—Conditions same as in B. H. 31 and 39, examination No. 1. Five minutes: Motility inhibited, bacilli collected in large clumps; spaces between clumps free from individual bacilli.

Fifteen minutes: Same as before.

Thirty minutes: Same as before.

Sixty minutes: Same as before.

Twenty-four hours: Same as before.

Small quantities of this specimen gave marked reaction.

Would consider the reaction typical of typhoid.

This report of these three cases shows what nicety of judgment is required in arriving at a decision in a case of doubtful reaction, and it is quite possible that occasionally two observers may differ in their interpretation of the same specimen. As a rule, however, I think we may depend upon the bacteriological accuracy of the test. But what shall we say of its clinical significance, so far as we can judge from the observations that have been detailed this evening? A brief review of the cases will aid us in answering this question, and also enable us to formulate certain general conclusions. In Groups I and III there were in all twenty cases of undoubted typhoid fever in which the blood was examined during the febrile stage. In two of these cases the test failed, even as late as the third and the fifth week of the disease. In one of the two cases (Lang's) the reaction has varied from day to day, being sometimes negative and sometimes doubtful, and I think it probable that his blood will yet respond to the test.* As an aid to diagnosis, however, the test can not be said to have proved of any value in these two cases; in fact, the negative result was absolutely misleading. On the other hand, of some eighty odd cases, non-typhoid in character, one case gave uniformly a positive result; a second case reacted positively on the first examination, but was negative on all subsequent tests. In several other cases the reaction was doubtful. In a total, therefore, of one hundred cases the results of the serum test failed to agree with the clinical diagnosis in four instances; in a number of other cases the reaction was uncertain or doubtful in character. In about ninety cases of the hundred the re-

* Two weeks after this paper was read a positive reaction was given by the blister fluid of this patient, convalescence being apparently established. The blood serum, however, still failed to react. One week later the patient had a relapse, and a reaction was obtained from both blood serum and blister fluid.

action was decided, and its accuracy was proved by the subsequent course of the disease.

Conclusions.—1. In the large majority of cases of typhoid fever the blood serum will give the so-called typhoid reaction at some time during the active period of the disease. In a small proportion of cases, perhaps ten per cent., the reaction will not be obtained, if at all, until the diagnosis has already been made from the clinical evidence.

2. In cases apparently non-typhoid in nature, a positive reaction may occasionally occur, but probably not oftener than in one or two per cent. of the cases. This pseudo-reaction is to be attributed to the protective bodies which, as we have seen, are present to a greater or less extent in normal blood serum.

3. In a varying proportion of cases, both typhoid and non-typhoid, a partial or doubtful reaction takes place. Repeated tests are then required in order to determine whether the reaction is due to the normal protective bodies or to the specific properties of typhoid blood.

4. The serum test of Widal is a most valuable aid in the diagnosis of typhoid fever. With greater experience and improved technique its value will in all probability become even greater and more clearly defined. For the present, however, the test should not be relied upon alone, but should be taken together with the clinical signs of the disease.

Dr. Egbert le Fevre said that he had examined the blood of a hundred and twenty-five individuals, making a hundred and eighty-five separate tests. He had applied the test in six cases of septicæmia and seven cases of pneumonia. Of these seven, six had been negative. One of these cases had been admitted a few hours after the chill, and there had then been no physical signs of pneumonia. A specimen of the blood had been taken at that time, and no reaction had been obtained. Four days later, the physical signs had become well marked, and the encapsulated diplococcus of Fraenkel had been demonstrated in the sputum. Another test of the blood at this time had given a positive and instantaneous typhoid

reaction. The "clumping" had been well marked, and the motion at once inhibited. Another examination, three days later, had given the same reaction. On the eighth day of the pneumonia, the disease terminating by lysis, a weaker reaction had been obtained. On the fourteenth day, when the temperature had reached normal, and resolution had been well advanced, there had been absolutely no reaction. Subsequent examinations of this case had given no reaction. The case had been under the same treatment as the other cases of pneumonia which had been examined at the same time with negative result. Eleven cases of phthisis had also been examined with negative result, although two of these had been cases of acute miliary tuberculosis, and from the clinical appearances there had been a suspicion of typhoid fever. Eleven cases of rheumatism had been subjected to the test, eight of them being acute. All of these had given a negative result. Six cases of cirrhosis of the liver had given a similar result. Two cases of acute hepatitis, two of nephritis, and two of obstructive jaundice, and several cases of dysentery had been examined, all with negative result. Seven cardiac cases had also been examined. One of these patients was still in the hospital. The blood of this one had been examined seven times, and there had been a reaction, but not so typical as that of some of the cases of undoubted typhoid fever. A careful inquiry into the history of this patient had given no evidence of her having had typhoid fever at any previous time. Six cases of malarial disease had also been examined. The blood had been taken in all cases during the height of the fever. In all the result had been negative. The presence of the plasmodium had been demonstrated at the same time.

The test had next been applied to five cases of "continued fever," or unclassified fever. No plasmodia had been found in these cases, and the subsequent history had only given ground for a suspicion of typhoid fever. In all these cases the result had been negative. The blood from one cases of illuminating-gas poisoning had been examined a few hours after admission, with a negative result. Nine cases of carcinoma had been examined, one of them being a case of carcinoma of the pyloric region of the stomach. Eight examinations had been made of this case, and every one of them had given a typical typhoid-fever reaction. The patient was an intelligent woman, and she stated absolutely that she had never to her knowledge had typhoid fever. Two cases of carcinoma—both of

the uterus—had also given a suspicious, although not a typical, reaction. Repeated examinations had given the same result. Five cases of epithelioma had given no reaction.

The test had been applied in eleven cases of undoubted typhoid fever. The first of these cases had been examined on the twentieth, twenty-sixth, twenty-ninth, and forty-fifth days of the disease, and had given a typical reaction. The second case had been examined on the seventeenth, twenty-fourth, twenty-sixth, and forty-second days of the disease. It had always reacted somewhat imperfectly, the reaction being developed slowly, and the inhibition of motion not being uniform throughout the specimen. Some portions had been agglutinated and without motion; others had been loosely clumped together. On the forty-second day of the disease, strangely enough, the reaction had been the most typical of all. The third case had been examined on the twenty-fourth and thirtieth days, and had yielded a prompt reaction. The fourth case had been examined on the forty-first day, or when the patient had been practically convalescent. At this time the reaction had been very prompt and satisfactory. The fifth case had been examined on the ninth day for the first time. The loss of motility had been prompt, but the bacilli had agglutinated very slowly. On the eighteenth day the reaction had been much more rapid and satisfactory, and on the twenty-first day it had been very marked. The sixth case had been examined on the eighth day. The reaction had been so very slow that at first the case had been thought not to be one of typhoid fever. On the twenty-ninth day, however, the reaction had been prompt. The seventh case had been examined on the thirteenth day, and had given a prompt reaction. The eighth case had been examined on the thirteenth day, and had given a prompt reaction. The ninth case had been examined on the tenth day of the disease, but with a negative result. This case had been complicated with pneumonia. On the twelfth day there had been a marked reaction, but it had not been until the fifteenth day that the reaction had been characteristic. The pneumonia complicating it had run a typical course. The tenth case had been seen soon after the onset of the disease. The man had been taken with a severe chill on a Wednesday night, and had been seen by the speaker in consultation on Friday night. At that time the headache, pain in the back, etc., had led to the suspicion of malarial fever or meningitis. An examination of the blood had been made on the third day, with a

negative result, and the reaction had not appeared on any day up to the sixth. At this time the reaction had been very prompt, although the blood of the previous day had given a negative result. The blood had been examined almost daily until the twenty-first day, when he had died from intestinal hæmorrhage.

Dr. Le Fevre said he had adhered to the method of growing the bacilli on agar-agar, for the bouillon he had found unsatisfactory unless it had been made with extreme care. He made a thorough emulsion of the bacilli in distilled water, and used this for the examination. Instead of using the ordinary ground-glass slide with a depression, he used vulcanite rings, and found them very convenient. By smearing both sides of the vulcanite ring, a hanging drop of almost any size could be obtained, and as many of them on a cover glass as was desired.

Dr. W. H. Park said that we could hardly expect the reaction on the first day. He had injected guinea-pigs with a pure culture, yet absolutely no reaction had occurred in the blood until the sixth or seventh day. After that, a marked reaction had been suddenly developed. From these experiments, and from the experiments of Pfeiffer on the human being, it was evident that we should not look for the reaction at the very beginning of the disease. A number of cases had come to him for examination in which marked reaction had occurred on what was stated to be the second day of the disease, but it should be remembered that it was often very difficult to determine the exact day of the disease. He did not think more than sixty per cent. of the cases gave a reaction within the first week, and about seventy per cent. in the first fourteen days. Probably nine tenths of all the cases gave the reaction after the second week. There could be little doubt about the case of Lang, reported by the reader of the paper, being one of typhoid fever; yet from an examination of the blood there was no reason for believing the disease to be typhoid fever. There were two cases now at the Mount Sinai Hospital, and a case at Roosevelt Hospital, running the clinical course of a mild typhoid fever, yet no decided reaction had been obtained from the blood. Probably in from five to ten per cent. of the cases no typhoid reaction had been obtained.

Regarding the duration of this reaction, the speaker said that at first he had expected that this reaction would be obtained for four or five years afterward, but further study had shown that usually in the course of three or four months the reaction practically disappeared. It was

exceptional for the reaction to appear later; hence, if one obtained a marked reaction, one could be pretty certain that it was due to a present typhoid fever, or one which had occurred only a few months previously.

As to whether it occurred in other diseases than typhoid fever, the speaker said that one must be very cautious in drawing conclusions. There had been a negro woman in the Roosevelt Hospital who had been admitted with what was supposed to be appendicitis. An examination of the blood had seemed to indicate typhoid fever. A week later another examination of the blood had been made, and the reaction had been very marked. The fever having passed away, an operation had been performed a week later, and a malignant tumor of the intestine had been found. The woman had been so ignorant that no reliable previous history could be elicited. He had only met with two cases of diseases other than typhoid fever in which a marked typhoid reaction had been obtained. Counting in two others reported to-night, there were four cases out of probably about five hundred cases that had been examined. It was evidently not a very common occurrence.

Regarding the manner of performing the test, Dr. Park said that his opinions had undergone material change as he had proceeded with the work. At first, he had been decidedly in doubt regarding the reaction itself. Now, he believed that it must take place immediately; he certainly would not care to draw conclusions from any reaction that might develop after half an hour. A reaction obtained after this time might be from a case of typhoid fever, but he certainly would not designate it a typical typhoid reaction. He had come to the conclusion that early in the disease the test might occasionally help in diagnosis; that later it would be a decided help, and that not finding it did not necessarily exclude typhoid fever.

Dr. Frank W. Jackson said that he wished to express his thanks to the reader of the paper for the very clear and fair way in which our present knowledge of this subject had been presented. Personally, he wished to speak from the standpoint of a clinician, as he did not profess to have any special knowledge of bacteriology. The question to be asked, from the standpoint of the clinician, was: "What is the value of this test in the diagnosis of typhoid fever?" The answer was, it seemed to him, that at the present time the value was not very great. The cases which had been quoted showed that Widal's

reaction was occasionally present when there was no typhoid fever, and *vice versa;* therefore, at present the clinician must continue to make his own diagnosis, no matter what might be the report of the bacteriologist. He did not wish to be understood as saying that the test had no value, but it certainly seemed to him there was still much to be learned in regard to the test and its limitations. That there might be much which was trustworthy in the test was shown by the fact that the blood from a large number of cases in which there could be no suspicion of typhoid fever, or other fevers, had been sent to the board of health from his wards at Bellevue Hospital, and in every one of these cases the board of health had reported no reaction.

The speaker then referred in detail to several of the cases mentioned in the paper. He said that one patient was a negro with but little intelligence, who had come to the hospital complaining only of pain in the ankles. His temperature had been about 103° F., and there had been no evidence of an acute inflammation about the ankles. The physical examination had been negative throughout. The supposition had been that the case was one of rheumatism, and after treatment for this condition for a few days the temperature had fallen to 99°. It had remained at this point for a few days, and had then risen again. The temperature keeping up, and being irregular, the original diagnosis had been questioned. Just at this time the man had had a general small vesicular eruption all over the body, sudamina. About a week or ten days after this he had shown superficial points of gangrene between the toes of both feet, together with complete anæsthesia of all the toes. The pain had then disappeared and the temperature had fallen nearly to normal. The gangrenous spots were now healing, and he now seemed perfectly comfortable, and simply had anæsthesia about the toes. He would like to know the correct diagnosis in this case—did it look like typhoid fever? If so, he had learned something new about typhoid fever.

Another, he said, was also a negro who had come in with a temperature of 104°, and with a red and swollen tonsil, and his had, at first, been thought to be a case of suppurative amygdalitis. His history, however, had indicated that he had had a cough and malaise for some time, and that he had raised blood. His blood had given a positive reaction for typhoid fever. His physical examination had been entirely negative, and the tubercle

bacillus had not been found in his sputum. At the end of three weeks the temperature had come down to 99.5°. This had been, perhaps, a case of typhoid fever, but it was quite as likely that it had been one of miliary tuberculosis of the lungs.

He was positive that the patient Lang had had typhoid fever, for he had presented all the characteristic evidence of that disease—the appearance of the face and of the tongue, the dicrotic pulse, the tympanites, the eruption, etc. Here the bacteriological examination of the blood had failed to give the reaction to Widal's test; yet no clinician could doubt that the case was one of typhoid fever.

Another patient, Bradley by name, had entered the hospital with an entirely different history. A week or ten days prior to admission he had begun to vomit. He had had a temperature of 103° on admission. There had been no enlargement of the spleen, but apparently a typical typhoid eruption. The report from the board of health had shown that the examination of the blood had been negative. At the end of two weeks the temperature had been normal. This case certainly looked like one of mild typhoid fever.

About the same time, a Swedish boy of sixteen had been admitted, with no history except that he had had pain in the left lumbar region for two weeks prior to admission. The physical examination had been negative; the temperature had been 103°. The temperature had varied about two degrees each day. His blood did not show the plasmodium. The first report from the board of health had said that the reaction was uncertain, and a very recent examination was distinctly negative. The boy had then been given quinine, night and morning. In spite of the quinine the case had pursued the course of a typhoid fever, and this seemed the most probable condition. It was evident, then, that in a certain number of cases the clinical diagnosis was quite clear, and therefore we did not need the help of the bacteriologist. On the other hand, in a certain number of cases in which we could not tell what was the matter with the patient, the bacteriologist seemed to be equally uncertain.

Dr. J. S. Thacher said that the opinions already expressed in this discussion coincided very closely with his own views, derived from his personal experience with the test. He had first taken it up with a good deal of skepticism, but had been delighted to find how uniformly the bacteriological test had coincided with the clinical

diagnosis. The number of exceptions that he had met with had been small—certainly small compared with those of other clinical tests that we used in medicine. He would indorse the conservative conclusions expressed by Dr. Park. We should bear in mind always the personal source of error on the part of the observer. It was necessary that the observer should have had considerable experience, for the line between failure and success in obtaining the reaction was not a sharp one. Then there was the difference in regard to the length of time that the blood from different cases required for the development of the reaction. He was glad to hear Dr. Park say that he now made it a rule to exclude those cases in which the reaction developed very slowly. Again, there was the uncertainty resulting from differences in the culture used. He had followed the rule of always employing a fresh bouillon culture—one not more than twenty-four hours old—but even then he had occasionally met with cultures in which the clumping, even without the addition of blood, had been considerable. Results might also differ with variations in the amount of serum used in the test.

There was another lesson to be learned from the discussion this evening. The general medical man was apt to hold an extreme opinion regarding the value of pathological reports—either that they were absolutely of no value, or that they were absolutely infallible. He would urge that the reports of pathologists should be weighed along with the clinical evidence, and taken in the same way. The pathologist should, at the same time, endeavor to indicate how conclusive he considered the evidence that he presented. A pathological report expressing doubt was often a much safer guide than one which assumed to present a final decision.

Dr. Alexander Lambert said that he would take an intermediate position between Dr. Jackson and Dr. Park, as he was both a clinician and a bacteriologist. It seemed to him extremely important to remember that there was a physical limit to the reaction, and the amount of blood mixed with the culture was an important factor in making the test, and also that the reaction must be immediate, particularly as regarded the inhibitory action on the motility of the bacilli; the clumping might come later. He had been aided by this test in making the diagnosis in two doubtful cases recently, the test giving a marked and positive reaction. The subsequent clinical course had amply confirmed the test. This test

was, of course, still in its experimental stage, but our present knowledge seemed to indicate that we had in it a very valuable aid to the diagnosis of typhoid fever in some doubtful cases. As with all the symptoms and signs of typhoid fever, the test must be considered in conjunction with the whole clinical picture.

Dr. Henry P. Loomis said that he was sorry that Dr. Brannan had not stated his conclusions regarding the value of the test. Personally, he had been impressed at the outset with its accuracy in cases giving clear evidence clinically of typhoid fever. At the New York Hospital he had had thirty examinations made in December, fifteen being in typical cases of typhoid fever. Every one of these had given a distinct and unquestionable reaction. Examinations had also been made in ten cases which had not been typhoid fever—*e. g.*, phthisis and rheumatism. The result in all these had been negative. Five cases had been reported as giving an undefined or partial reaction. Of these, one had been a case of undoubted typhoid fever, judging from the clinical standpoint. Another had been a case of bronchitis, which had given a doubtful reaction at first and a negative result afterward. The third had been in a Cuban who had had a fever of doubtful nature. The two other cases had not appeared clinically to be typhoid fever. He would say, therefore, that the reaction in typhoid fever was positive, but that it was not a great aid to the diagnosis, because in the second week the clinical evidence was usually sufficiently clear. He had never seen the reaction before the eighth day. He had observed it a month after recovery from typhoid fever. In the cases in which the clinician was most in doubt, the test was very apt to give a doubtful reaction.

Dr. N. E. Brill wished to say a few words in reference to the important subject under discussion, inasmuch as he had had the fortunate opportunity of conducting a series of observations in the cases of thirteen nurses sick with typhoid fever at the Mount Sinai Hospital Training School. These observations had been the results of most careful tests of the Widal reaction made by the assistant pathologist of the hospital, Dr. Charles A. Elsberg, who had charge of the bacteriological work relating to these and other cases at the hospital. All of the nurses who had been sick had suffered with typhoid fever. Of the thirteen, up to this time eleven had given positive reaction to the Widal test; however, two of the cases had as yet given no positive reaction.

It should be said, moreover, that all the patients had given indefinite symptoms of illness extending from ten to fourteen days before each had taken to bed. After they had taken to bed—all had been sick in bed within three days of the time that the first nurse had given up—the Widal test had been immediately instituted. One case had given a positive reaction as early as the third day after being confined to bed; the twelve others had only shown the first positive reaction in periods varying between eight and ten days after confinement. Taking into consideration the fact that the period of illness before going to bed had extended between ten and fourteen days, most of the patients at the present time were apparently in the third week of their disease.

One of the interesting features of his observations of this reaction had been this: two patients, and they were perhaps suffering with a more intense infection—they were the most seriously ill—had up to the present time not given a positive reaction at any time.

He wished to say here that specimens of blood had been taken daily from all of these cases and thoroughly tested by Dr. Elsberg, so that the results of the observations could not be questioned. Yet, in the two cases just mentioned, all the characteristic symptoms of typhoid fever had been present, and except in intensity they did not differ clinically from the other eleven. This observation coincided with the results that had been reported in a recent number of the *Lancet* by Dr. Durham and in another article in the same journal by Dr. Gruenbaum. Of the cases of the latter, one had been under observation throughout the entire course of a typhoid and for eighteen days after convalescence had occurred, and still during no period of this time had a positive Widal reaction been obtained. Durham had reported two similar cases.

As to the time that the reaction persisted, Dr. Brill stated that Widal said it disappeared after the forty-first day. This appeared to him to be still a question to be determined. Some observers claimed a much longer period of persistence of the reaction. So far as his own observations went, in his own case, having been a victim of a most severe typhoid, with three distinct relapses, covering a period of illness in bed extending over three months and incapacitating him from work for seven months, which had occurred just two years ago, a test of his blood a few days ago had given a negative reaction. The speaker further stated that his house physician at the

hospital had had an attack of typhoid extending over September into October of this year, and at the end of November and early in December no positive reaction could be obtained.

He indorsed the conservative opinion expressed by Dr. Park in the discussion. Undoubtedly the test was an important aid to diagnosis, especially in doubtful cases. In ordinary cases it was not of much value except as corroborative, for since the blood reaction appeared only after the eighth to tenth day, the clinical signs were sufficient at that time to establish a true diagnosis. He regarded it of most value in deciding the nature of cases of continued fever in which a suspicion of typhoid, not justified, however, by clinical signs, might arise.

Before closing, he wished to call attention to a point which had not been touched upon or mentioned by any of the previous speakers, and it was one of most interest and importance to him, since he could not explain it satisfactorily.

The point was this, that two of his cases had shown a positive reaction for a few days, after which the reaction had disappeared for an entire day, to reappear again, however, on the day following its absence. The criticism might be made that the inability to obtain the reaction was due to a fault in technique or to some trouble with the pure culture itself. This criticism, however, must be void, because the same pure culture which had been used to obtain the test with the blood which did not show the reaction on an intermediate day, had given positive results with the blood of the same patient which had shown the reaction on the day before.

He regarded no result as a positive test unless there was "clumping" of the bacilli, together with rapid inhibition and finally total cessation of movements in the bacilli. Clumping alone could not be regarded as a positive test, for that reaction had occurred in the blood of a patient suffering from erysipelas, in one from pneumonia, and in one from Bright's disease, as he was informed by Dr. Elsberg. Even normal blood in proportion of more than one to six produced clumping.

Meeting of March 3, 1897.

The President, Dr. Lucius W. Hotchkiss, in the Chair.

Epithelioma of the Tonsil, Pharynx, and Tongue. Operation. Recovery.—Dr. Fred Walker Gwyer presented a case of this kind. The patient, a painter, fifty-two years of age, had been referred to him by Dr. C. G. Coakley, to whom the case had been sent by Dr. C. H. Ludlum, of Hempstead, Long Island. At the time of his first visit to Dr. Coakley, October 7, 1896, he had been suffering some pain in the throat, mostly on the left side, with occasional slight pain in the region of the left ear, and some difficulty in swallowing. He had been perfectly well up to six weeks prior to this visit, and the dysphagia had only lasted three weeks. Previous to this illness, the patient had always been in good health. An uncle had recently died of cancer.

Examination had shown the patient to be fairly well nourished, and to have very slight cachexia. Inspection of the mouth had revealed a large, bright red, cauliflowerlike mass occupying the side of the left tonsil, and invading both the anterior and posterior pillars of the fauces. The growth had also invaded the lower border and anterior surface of the velum, extending about halfway to the median line. The left half of the tongue, in the region of the circumvallate papillæ, had a similar growth, covering an area of about an inch anteroposteriorly and three eighths of an inch wide. The growth had been so large that it had been impossible to get a mirror in the back of the throat to see how far down the growth extended. Digital examination, however, had shown the epiglottis and the structures at the upper part of the larynx on the left side apparently free from any infiltration. On the left side, below the angle of the jaw, one or two enlarged lymphatic glands had been felt. The diagnosis of epithelioma had been made. From the lines of extension, and the amount of tissue involved, it had seemed likely that the growth had originated in the tonsil.

Dr. Gwyer said that he had operated on the patient on October 14, 1896, an incision being made under the left side of the jaw from the symphysis to a point a little posterior to the angle. The lingual and facial arteries had been found and tied, the submaxillary gland, and two or three lymphatic glands which were enlarged, had been removed, and the floor of the mouth opened

into. Finding that there would be insufficient room for the work in hand, even were the tongue removed, the incision had been prolonged anteriorly from the symphysis upward through the lower lip, and, after drawing the lower left middle incisor tooth, the jaw had been sawed through just to the left of the median line. On dropping the jaw, no difficulty had been experienced in drawing the left half outward and upward, so that it lay at a right angle to the normal position and gave a full view of the left side of the mouth and pharynx, even to the epiglottis, and plenty of working room. The left half of the tongue from tip to base had then been easily removed, and with little hæmorrhage. Beginning anteriorly, the left pharyngeal wall had been removed, including the pillars of the fauces and the tonsil; in doing this, the dissection by scissors had been carried to the basement fascia separating the pharyngeal membrane and muscles from the external parts. A good portion of the left posterior wall had next been removed, together with all of the left velum. Examination had revealed no further sign of the growth, and the operation had been thought to be radical.

The tip of the tongue had been brought around and stitched to the base, doubling the tongue laterally upon itself, a couple of sutures above and below closing that wound. His idea in doing this had been that just so much raw surface would be closed in, and that the anterior muscle fibres, by acting upon the base of the tongue, would facilitate deglutition. Some portion of the mucous membrane had been sutured with catgut, the jaw drilled and fixed in place by silver wire, and the outer wound closed with silk. The dressing had consisted of strips of iodoform gauze, about an inch wide, pasted on with iodoform collodion, and over this a gauze-and-cotton dressing, which had been removed the next day. The patient had done remarkably well constitutionally. Although the operation had lasted over two hours, a large surface had been exposed, and anæsthesia (at first ether, then chloroform) had been difficult, there had been no shock or subsequent rise of temperature. The diet for the next several days had been milk, and some difficulty had been experienced in keeping the mouth clean. The outside wound had healed promptly except near the angle of the jaw, where there had been some suppuration, owing, no doubt, to infection through the mouth. This had healed in a couple of weeks. The interior wound had granulated and healed in about six weeks. Owing

to the difficulty in keeping the mouth clean, already mentioned, suppuration had occurred at the point of division of the jaw, and the wire sutures had worked loose and failed to hold the jaw fixed. About six weeks after operation the patient had been sent to the New York Dental School, and had there been fitted with a very satisfactory interdental splint, after which there had been no further trouble. Three months after operation the patient had been examined, and the jaw found to be firmly united, and no return of the growth. About three weeks ago he had again presented himself with a suspicious enlargement under the left side of the jaw. This had been traced to a furuncle lower on the throat on the same side. At present, he was inclined to think it very suspicious and should remove it as soon as possible.

The patient talked fairly well, and ate and swallowed well. A few days ago Dr. Coakley had examined the patient with him, and had failed to find any return of the growth.

The speaker called special attention to the following points: The comparatively slight scar; the even line of union of the bone; the use the patient had of the remaining tongue; the smooth appearance and feel of the left pharynx; the very slight hæmorrhage that occurred; the large field for operation made by division of the jaw; and the consequent thorough and easy removal of the lateral pharyngeal wall.

The pathologist's report, by Dr. E. P. Shelby, of the Loomis Laboratory, was as follows: "The tonsil shows marked epithelial invasion. In places there is a distinct fibrous stroma, which surrounds masses of epithelial cells. In the tongue there is a downgrowth of epithelium, which extends into the muscles and other deep structures. Round-cell infiltration is present in places, and here and there epithelial 'nests' are seen. The growth is unquestionably an epithelioma."

Dr. J. F. Erdmann said that the result in such cases was often good after operation. He recalled a case of epithelioma of the jaw, involving about an inch of the pharyngeal wall, in which he had excised the left half of the inferior maxilla, a portion of the pharynx, and the floor of the mouth on that side. The wound had healed by granulation, and had secondarily recurred after eighteen months. Within the last ten days he had seen a case of carcinoma involving the mucous membrane on the left side, with involvement of the sublingual and

submaxillary glands and the side of the pharynx. The primary operation had been done on February 22d, the involved glands, the sheath of the carotid and of the internal jugular had been dissected out, and half an inch of the pneumogastric nerve removed between the superior and inferior laryngeal branches; also three inches and a half of the internal jugular vein. The nerve had not been involved in the growth, but there had been considerable pressure upon it, and the nerve had been accidentally ligated and cut. The divided ends had been united by sutures. There had been no effect upon the heart, but at the present time the patient had a decidedly brassy voice.

Dr. GWYER said that after the removal of the glands he had found that there was no hope of reaching the pharyngeal wall by the original incision, so the incision had been prolonged.

Enterectomy followed by Circular Enterorrhaphy by Maunsell's Method.—Dr. FREDERICK HOLME WIGGIN reported a case of this kind. A woman, sixty-six years of age, who had been an alcoholic for many years, had been admitted to the gynæcological ward of the City Hospital on December 28, 1896. She said that a laparotomy had been performed upon her two years prior to admission, and that she had been obliged to work hard afterward. About six months prior to admission to the hospital she had received several severe blows on the abdomen, after which there had been noticed a protrusion of the abdominal wall in the umbilical region. She stated that recently she had been knocked down and tramped upon by a horse, and that this had been followed by the formation of an abscess in the wall of the abdominal protrusion, by sloughing of the skin covering the protrusion and by the formation of an ulcer about two inches in diameter. Soon after her admission, while she was being bathed, the tissues forming the base of the ulcer had given way and allowed the escape of the intestine from the peritoneal cavity. Through some misunderstanding the condition had not been reported to the house surgeon for several hours. When he had first seen the case, several coils of ileum had been outside of the abdominal wall and among the bedclothes, and the edges of the opening in the abdominal wall had been gangrenous. The protruding gut had been dark, inflamed and thickened, and held together by strong adhesions. As the gut had been evidently constricted tightly, and also infected, preparations had immediately

been made for excision. After the opening in the abdominal wall had been enlarged by cutting off its gangrenous edges, about two feet of the bowel had been removed. The divided ends had been united by the Maunsell method. After the invagination had been reduced, it had been found necessary to further approximate the peritoneal coats by several Lembert's sutures. After the abdominal cavity had been thoroughly flushed with a very weak solution of hydrogen dioxide—all that had then been available—the gut had been returned into the peritoneal cavity, and the latter freely flushed with saline solution. Some of this solution had been allowed to remain in the cavity. The walls of the abdominal wound had been next approximated by a single row of silkworm-gut sutures. The case had progressed favorably for about forty-eight hours, when persistent nausea and vomiting had set in, and the belly had become tympanitic. Various cathartics had been administered, but without avail. On the morning of the fourth day a small quantity of gas had passed by rectum, but the vomiting had persisted. As the abdomen was then much distended, it had been thought best to reopen the incision and ascertain whether or not there was any obstruction. On opening the wound the distended bowel had escaped, and it had become necessary to puncture the bowel in order to relieve some of the flatulent distention. It had been found that the peritonæum had become generally inflamed, and that the bowel was flexed just below the point of anastomosis and was adherent, inclosing a small abscess in the mesentery. This abscess had contained about a drachm of pus. It had been removed and the infected area disinfected with a solution of hydrozone. This portion of gut had been isolated by means of iodoform gauze strips, the ends of which had been brought out through the abdominal wound. The patient had not rallied, and had died a few hours later. His main object in reporting the case was to show, by the specimen presented, how perfectly the bowel could regenerate in four days after enterorrhaphy.

The PRESIDENT said that this case showed how difficult it was to determine at the operation the true condition of the gut. He had only done four intestinal resections by this method of Maunsell's, but in one, a case of carcinoma of the sigmoid flexure, the proximal end of the gut, although apparently viable, had been soft, and the patient had died a week after the operation, apparently from an auto-toxæmia. A second fatal case had

occurred after a resection, made wide of the gangrenous area, in a peculiar hernia case. The intestinal wound had become infected, and the patient had died in about three days. In that case there had been intestinal paresis and toxæmia.

Dr. WIGGIN said that in the case he had just reported the patient had been in bad condition, and the edges of the opening had been gangrenous. From his experience with this method of anastomosis he did not think that it was more likely to be followed by prolonged intestinal paresis than when other means were employed. In another case there had also been persistent vomiting, but the repeated administration of small quantities of salines had finally proved successful. In view of the evident strength of the union in the anastomosis just exhibited, he would not be afraid in the future to give salines, either by mouth or by enema. It was certainly exceedingly difficult to determine at the time of operation whether or not the bowel was in such a condition as to retain its vitality if allowed to remain.

Paper.

REPORT OF A CASE OF MALIGNANT PAPILLARY DERMATITIS, WITH ESPECIAL REFERENCE TO ITS PATHOLOGY.

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THE case which is herewith presented for your consideration and discussion belongs to that comparatively rare group which was formerly designated by the title of Paget's disease of the nipple, although Velpeau described the condition many years before Paget called attention to the disorder. Of late, owing to a better understanding of its pathology, the belief is becoming general that this disease is a true carcinoma of the skin from its inception, rather than, as was formerly thought, *that its malignancy was secondary*, or the result, in other words, of a long-continued irritation, caused by a primary eczema. The probability that the

condition under consideration is primarily of a malignant nature, coupled with the fact that similar conditions have been recorded affecting the skin of other regions of the body than the female breast, would seem to make the title with which this paper is headed—malignant papillary dermatitis—not only a more appropriate but a more correct designation than that formerly employed. The disease occurs most frequently in women who have reached or passed the menopause, and usually begins in the epidermis of the breast surrounding the nipple, although, as has been already stated, it is not necessarily confined to this locality. The signs of the disease are, at first, those commonly found in eczematous conditions, which, on this account, are frequently mistaken for it. There are roughening, reddening, and scaling of the epithelium situated about the centre of the nipple, accompanied by a slight oozing and crusting, and a tingling, burning pain. Gradually fissures form, the trouble progressing slowly but steadily till, as Paget says, there is presented for inspection an ulcer having a sharply defined border, with a "florid, intensely red, raw surface, very finely granular, as if nearly the whole thickness of the epidermis were removed." Sooner or later the nipple retracts completely. Hardaway, in his article on the Surgical Diseases of the Skin, in vol. iii, page 460, of Dennis's *System of Surgery*, says that the disease may exist for years without determining any deterioration of the general health, but that unless removed it will ultimately prove fatal. On the other hand, if the diseased tissue is removed at an early date, the prognosis is favorable. Van Harlingen, in his work on *Diseases of the Skin*, page 93, says that in his opinion this disease is actually or potentially a carcinoma, and should be treated as such.

On January 20, 1897, Mrs. E. L., a widow, fifty years of age, was admitted to the gynæcological ward of the City Hospital as a private patient. She stated that her mother and most of her brothers and sisters had died of phthisis, that her mother had been subject,

from time to time, to carbuncular disease, but that, as far as she knew, no member of her family had ever suffered from any form of cancer. As a girl, she had always enjoyed good health, her first menstruation occurring in her twelfth year, and being regular and painless thereafter. She had married in her eighteenth year, and had had two miscarriages and ten children. Her confinements had been, for the most part, difficult, necessitating the employment of instruments. Her nipples had been small, and she had nursed her children with difficulty. About five years ago, and seven years after the birth of her last child, the patient noticed for the first time a small sore, which appeared on and around her right nipple. It grew gradually, being somewhat circular in form. After a time the patient noticed the occurrrence of an intermittent discharge of a clear, viscid fluid. Occasionally the patient had been troubled by a sensation of tingling and burning, but otherwise the disease had been painless. On examining the affected breast, an inflamed area, of about two by three inches in extent, was found to surround and include the right nipple, which was retracted. This area had a sharply defined border, and its surface presented a granular and bright-red appearance, slightly streaked with white. The underlying tissues were infiltrated, but no tumor could be felt in the breast. As there seemed to be no doubt, after a consideration of the patient's history and the signs of the disease, that it was one of malignant character, the patient was advised to submit to excision of the diseased tissues. This was done on the day of her admission to the hospital. After the skin had been incised about the ulcerated surface, a hard nodule could be made out in the substance of the breast, and the entire organ was removed, together with the contents of the axilla. Several of the glands proved to be enlarged, although this condition could not be made out till after the axilla had been opened. The convalescence, excepting for a slight infection of the wound occurring after the first dressing, was uneventful.

Pathological Anatomy (Professor Fordyce).—The specimen of Paget's disease submitted to me for examination consisted of the entire diseased tissue, involving a surface area of about six square inches, together with the underlying mammary gland. The

glandular tumor was not larger than an English walnut, and rather soft on pressure. On squeezing it, a whitish fluid was discharged through the lactiferous ducts at the former site of the nipple.

A portion of the tissue was fixed in a four-per-cent. formalin solution, and subsequently hardened in alcohol; another portion in alcohol of increasing strengths.

Various staining methods were employed, which will be referred to later.

An examination of the gross specimen showed the area involved by the superficial inflammation to be somewhat depressed below the level of the surrounding healthy skin. Under a low power this depression is seen to depend upon a partial destruction of the epidermis. The derma is slightly thicker than the healthy skin with which it is directly continuous, its increased thickness being dependent on the dense cellular infiltration, œdema, and connective-tissue growth. Under a low power the most striking changes are seen to involve the epidermis and the underlying papillary region of the true skin. The superficial dermal region is the seat of a dense cell infiltration, which extends in a less diffuse manner along the course of the small blood-vessels and sweat ducts to the deeper portions of the cutis. With hæmatoxylin and eosin stain the cells appear to be chiefly of the single nucleated variety. In the region of the epidermis, however, many polynuclear leucocytes are seen among the first-mentioned variety of cells. The connective-tissue bundles among which the cells are found are forced apart by the serous effusion which is constantly secreted by the diseased tissues in the living state. The connective-tissue fibres, as well as many of the cells in the papillary region, take up the stains badly, and appear to have undergone a partial necrosis. In the deeper tissues the cell infiltration is seen more especially along the course of the capillaries, the sweat ducts, and the hair follicles, with the accompanying sebaceous glands.

The lactiferous canals below the nipple and in the deeper tissues are in places surrounded by foci of uni-

nuclear lymphoid cells which stain intensely, and seem to be of recent origin. Some of these canals are surrounded by a dense growth of young connective tissue, which appears to be a conservative process intended as a protection against the invasion of the proliferating epithelium of the gland (Fig. 1).

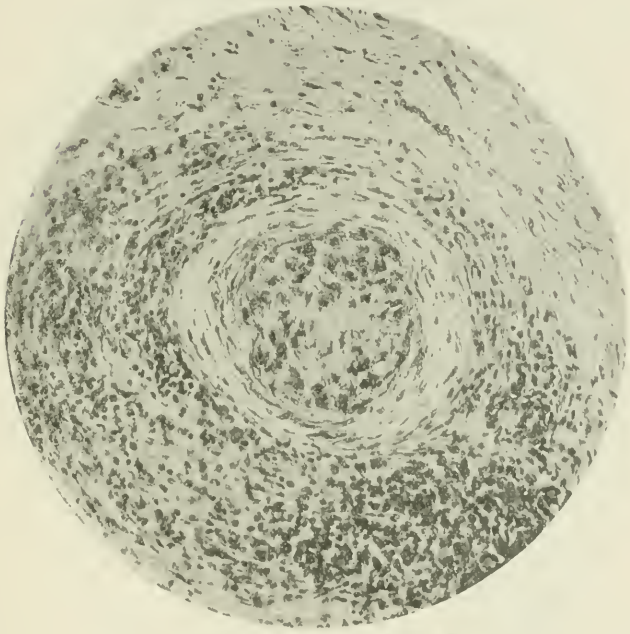

Fig. 1.—Spencer ⅛, projection oc. 2. Lactiferous canal surrounded by connective-tissue growth and lymphoid cells.

At the periphery of the glandular tumor, with the exception of a slight dilatation, the lactiferous canals were found to be quite normal. Directly below the nipple the ducts were dilated to a considerable degree, and filled with proliferating and degenerating cells (Fig. 2).

The active process was the predominating one, however, as mitotic changes were frequent, and the cells were readily stained by the reagents used. In the accompanying photograph (Fig. 3) the intracanalicular proliferation of the epithelium, as well as the beginning infection of the surrounding tissue, is shown.

The basement membrane of most of the canals was intact, even in those which were widely dilated. In some, however, the epithelial elements were seen to be

Fig. 2.—Spencer ½, compensation oc. 4. A dilated milk duct filled with proliferating and degenerated cells.

breaking through into the surrounding connective tissue, showing an early stage of the malignant process.

The invasion of the dense connective-tissue stroma by the atypical epithelial processes is shown in Fig. 4.

We have in this latter illustration clear proof of the malignant nature of the gland tumor.

In sections stained with Unna's polychrome-methylene-blue solution, and decolorized with neutral orecin, a large number of "*Mastzellen*" (granular cells) were seen in the papillary region, about the glandular appendages, scattered irregularly throughout the connective tissue, and among the fat cells. The cell nuclei, by the method in question, stain a light blue, while

their numerous large granules take on a red color. They are several times larger than the ordinary lymphoid cells, and seem to invade the tissues in an irregular manner like foreign bodies.

Although present in many pathological conditions, as well as in normal tissue, their number was vastly increased in the case under investigation. The part which they play in the disease process, as well as the nature of

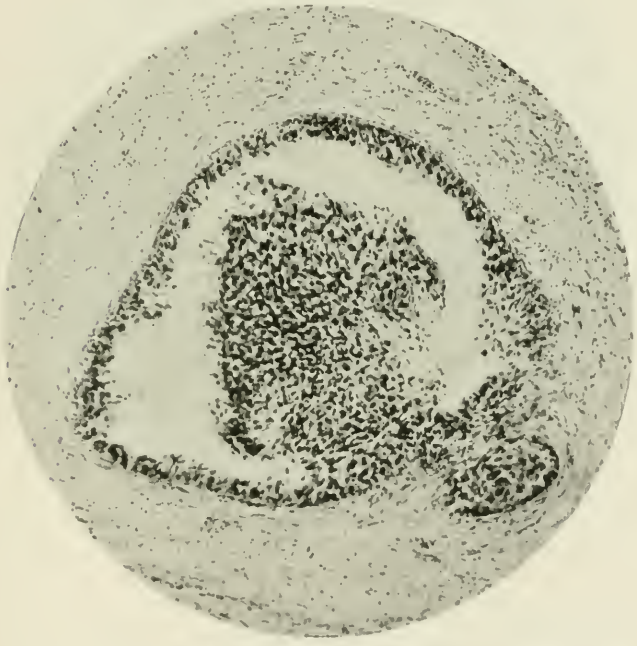

Fig. 3.—Spencer ½, compensation oc. 4. Intracanalicular proliferation of epithelium.

the irritant which calls them into activity, must, in the present state of our knowledge, remain problematical.

The earliest and most carefully studied changes in Paget's disease are those met with in the surface epithelium. It is here that the cell changes and inclusions are met with which were first described by Darier, and afterward by Wickham and others, as coccidia. For a time the ætiology of the affection was thought to have

been discovered in these so-called unicellular animal organisms, and a long step taken in advance regarding the causation of cancer. A more careful study of these cell degenerations has pretty conclusively demonstrated

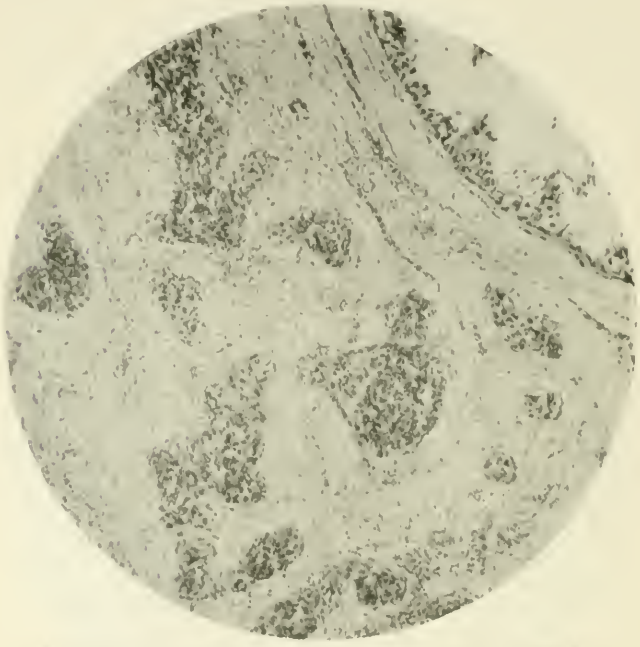

Fig. 1.—Spencer, ½ compensation oc. 4. Invasion of connective-tissue stroma by atypical epithelial processes.

the non-parasitic character of many of them. The infectious nature of Paget's disease has, however, by no means been absolutely disproved, and an element of doubt yet remains as to the character of certain of the cell changes which are found in the affection.

In an early stage of the disease, before the horny layer has ceased to be formed, the epidermis is found to be distinctly thicker than normal, but its constituent cells are altered in a curious and quite characteristic manner. In many of them the nuclei are swollen as the result of cellular œdema, and are encircled by a clear space, from the retraction of the surrounding

protoplasm. In alcohol preparations this retraction of the surrounding protoplasm is more distinctly shown, as in Fig. 5.

As the epithelial changes become more advanced the nuclei disappear from many of the swollen cells,

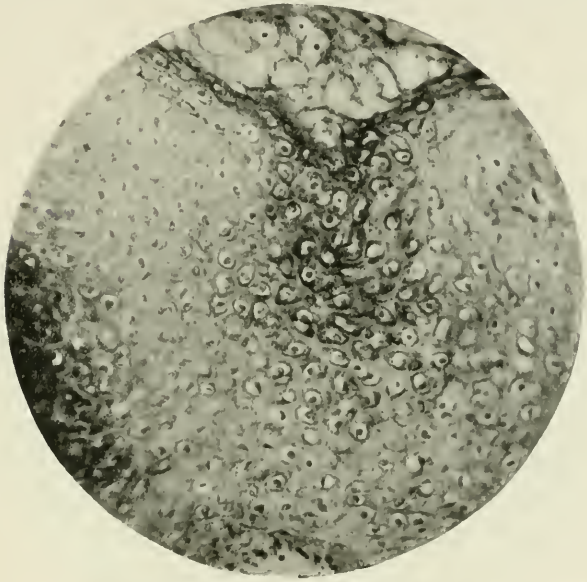

Fig. 5.—Spencer ⅛, projection oc. 2. Thickening of the epidermis and retraction of the protoplasm from the cell nuclei.

leaving clear, cystlike cavities surrounded by a distinct membrane (Fig. 6).

In other cells the nuclei are deformed and pushed to one side by the adjacent swollen cells.

Where several nuclei are inclosed in a cystlike cavity, formed by the confluence of adjoining cells, their resemblance to parasitic inclusions is very striking. The epidermis was the seat of a proliferative process as well as a degenerative one, as numerous irregularly shaped downgrowths of epithelium were met with, extending for some distance into the corium. Certain cells in these down-growing columns showed the characteristic œdematous changes, and others presented mitoses.

In addition to the changes mentioned, a number of the epithelial cells were found to be invaded between the cell wall and the nucleus by small, round or oval, deeply stained bodies, about the size of the nucleus of a white blood-corpuscle. These cells, which I regarded as leucocytes invading the epithelium,

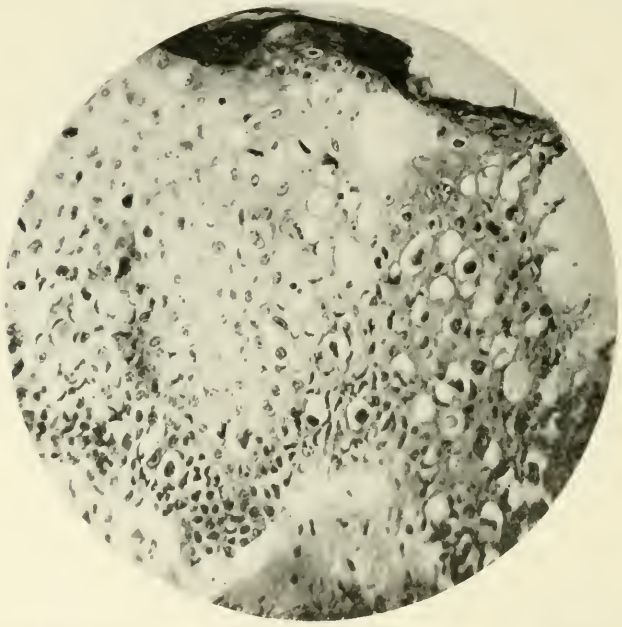

Fig. 6.—Spencer ½, projection oc. 4. More advanced change in the epidermis showing numerous vacuoles and altered cells.

correspond to Wickham's description of the early stage of the coccidia.

I have noted similar invasions of epithelial cells by polynuclear leucocytes in many widely divergent conditions, and can attach little importance to their presence in this case.

In a still farther advanced stage of the disease the horny epithelial layer is entirely absent, and nothing remains of the epidermis excepting two or more layers of swollen rete cells. In places the epidermis is replaced by degenerated connective tissue, inclosing leu-

cocytes and *débris* from the blood and cell infiltration. Islands of normal epidermis are met with, bounded on either side by partially degenerated cells. At the margin of the patch the change from healthy to altered epithelium is abrupt, normal cells lying beside the swollen and otherwise degenerated ones. In the hair follicles similar changes are met with, the outer layer containing many vacuolated and œdematous cells.

The morbid changes in Paget's disease may be briefly stated as inflammation of the papillary region of the derma, leading to an œdema and vacuolation of the constituent cells of the epidermis, followed by their complete destruction in places and their abnormal proliferation in others. The change in the epithelium of the lactiferous canals and glandular epithelium, which is also of a proliferative and degenerative nature, is secondary to the changes in the surface epithelium, and may be regarded as of the same nature, and probably produced by the action of the same irritant. The overdistention of the lactiferous canals by the proliferating epithelium, resulting in a malignant infection of the surrounding connective tissue, is the usual termination of the affection, and is well shown in the case described.

The chief point of interest in this particular case is the length of time that the disease had existed prior to the occurrence of malignant infection—nearly five years —as the microscopical examination of the diseased tissues after their removal demonstrated the fact that this degeneration was of recent origin. The usual duration of the disease before this change occurs is about three years, but instances have been recorded where it has extended over twenty years before showing evidence of definite carcinomatous degeneration of the underlying glandular tissues. Generally, malignant papillary dermatitis is readily distinguished from eczema of the nipple, as the ulceration occurs later in life, is unilateral, its borders are more sharply defined, its surface presents a redder and more granular appearance, the underlying tissue being infiltrated, and it is accompanied by retraction of the nipple and nodules in the organ, which is

not the case in eczema. As soon as the disease is recognized, the breast should be excised, and if the disease is determined early and the proper treatment is promptly applied, there need be little or no fear of a recurrence of the trouble.

Dr. ERDMANN asked if there had been any axillary involvement in these cases.

Dr. WIGGIN replied that in this case several enlarged axillary glands had been found, but no minute examination had been made of them. Some years ago he had presented a report of another case of this disease, in which the operation had been done in 1890, and there had been no recurrence since then. Dr. Dunham had examined that breast, and had found evidence of fibrous change, but none of carcinoma. The disease had, however, only existed about two years.

Perforative Ulcer of the Duodenum, with General Suppurative Peritonitis, mistaken for Perforative Appendicitis.—Dr. IRVING S. HAYNES reported such a case. The patient, a sailor, twenty-two years of age, had been admitted to the Harlem Hospital January 15, 1897. He had never had typhoid fever, but had contracted syphilis about five years before. He stated that he had suffered for eighteen months previously with severe attacks of pain in the right umbilical region, which would subside spontaneously after a day or so. Five days previous to his admission he had had such an attack. The three following days he had been under the influence of alcohol. On January 14th, at 4 P. M., while still intoxicated, he had been seized with a severe attack of pain in the region of the umbilicus, radiating to both sides, especially toward the right iliac region. This had continued with increasing severity. A physician who had been called in on the following day had diagnosticated perforative appendicitis, and the man had been brought into the hospital the same day at 3 P. M. His temperature was 103.8°; pulse, 126; respirations, 40; he had an anxious expression; the abdomen had been swollen and tender, especially on the right side; thighs flexed. At 8 P. M., under ether, the usual incision for appendicitis had been made, and had given vent to yellow flocculent serum. The colon and ileum had been dark, reddish-brown in color, showing intense congestion, and covered with thin whitish patches of the general adhesive peritonitis. The appendix had proved to be only slightly

congested on exposing it; had been bent upon itself, but not constricted. The ascending colon and ileum had been examined through the incision, but nothing had been found to account for the peritonitis. On opening the abdomen in the median line above the umbilicus for four inches, the same condition of peritonæum and intestines had been found, and the latter had been greatly distended with gas. The stomach, transverse colon, and the small intestine had been examined through the incision without a cause for the condition being found. Gall bladder and lower surface of liver also had been examined. The peritoneal cavity had been irrigated with hot saline solution, iodoform-gauze wicks had been introduced into the abdominal cavity, the wounds partially closed, and the patient hurried to bed. During the operation the pulse had been 195. The patient had regained consciousness after the operation: temperature had fallen to 99°, pulse to 160. He had died at 2.30 the next morning.

The autopsy had shown a small circular hole through the posterior wall of the duodenum, half an inch beyond the pyloric valve. The ulcer had been about an eighth of an inch in diameter. The abdominal cavity had been filled with a yellowish fluid and fibrin flakes, and the viscera and peritonæum had been intensely congested.

The speaker said that in the *American Yearbook of Medicine and Surgery* for 1896 two cases of perforating duodenal ulcer were cited from Marmaduke Shield, in which cœliotomy had been performed for supposed perforative appendicitis.

Two other recorded cases were referred to to show the great difficulty in making a correct diagnosis. His conclusions were: (1) That in perforative peritonitis we were not sure that the duodenum was the seat of lesion unless it was distinctly made out that the beginning of the pain was in the epigastrium or right hypochondrium, or that epigastric symptoms, such as pain and vomiting, had preceded the peritonitis. (2) That in view of the frequency of duodenal ulceration in males, the possibility of its presence should always be borne in mind when a surgeon was called to a case of perforative peritonitis in a man. (3) That the non-feculent and occasionally acid nature of the extruded fluids and gas might serve as a valuable diagnostic aid, and that the incision should be small, an exploratory effort only, until this vital point was made clear. (4) In severe shock the surgeon should wait a few hours before operating,

and when he operated he should wash the peritoneal cavity thoroughly with warm water and insert a tube into Douglas's pouch.

An Operating Chair Designed for Use in Bellevue Hospital.—Dr. ROBERT MACLEAN TAFT, in presenting the chair, said that it had been designed chiefly for the purpose of facilitating the work of the dressers in the office of the hospital, but the chair would also be found of service in the office of the physician. It was made of metal, finished in white enamel, and could therefore be easily kept thoroughly clean. The arm pieces consisted of two metallic plates, with a groove between them for carrying off the fluids into a receptable suspended underneath. Similar provision was made for collecting the discharges while dressing wounds about the head and face. The chair could be easily converted into an operating table, capable of assuming at the pleasure of the operator the horizontal or the Trendelenburg position, and there was a simple but strong mechanism for raising, lowering, and revolving the chair.

Paper.

THE TREATMENT OF TYPHOID FEVER.

By CONDICT W. CUTLER, M. D.

FROM an analysis of about a hundred cases of typhoid fever under my own personal observation with a mortality of nearly ten per cent., and from the statistics of others showing a mortality ranging from seven to fourteen per cent., it would seem that the death-rate from this disease depended more largely upon the character of the epidemic than the plan of treatment employed.

During the past fifteen years numerous methods of treatment have been recommended and faithfully followed by careful observers, but after a thorough trial have either been given up or greatly modified to suit the judgment of the attending physicians. Many of these methods of treatment have had for their object the elimination of the typhoid poison, the stimulation of the central nervous system, the reduction of temperature, or intestinal antisepsis. Among the most prominent of these

may be mentioned the Brand system of baths and the Woodbridge guaiacol treatment; but owing to the unsatisfactory results often obtained these plans of treatment have been so modified that Brand and Woodbridge would hardly recognize them as their own. And so it has been with all other so-called systems of treatment. They have been popular for a time, then modified, and at last given place to some other method with hopes of a better result. To show how unsatisfactory and varied are the present methods of treatment one need but look at the expressions of opinion of some of the most experienced practitioners given at a meeting of the Academy of Medicine on October 20, 1896:

Dr. W. Gilman Thompson stated that the cold-bath treatment caused enteric fever to run the shorter and milder course and reduced the mortality one half; but it did not prevent relapses nor the occurrence of ordinary complications, and it did not interfere with other modes of treatment.

Dr. Morris Manges said that experiments had been made with cultures of typhoid bacilli and with serum, but little had yet come from them clinically. As to intestinal antisepsis, Stern and others had shown that they were not effectual even on micro-organisms less resistant than the typhoid bacilli.

Dr. Francis Delafield said that the bath treatment was absolutely impossible for a considerable number of patients; that he had treated thirty cases with the Woodbridge treatment carried out literally at first, and afterward in a modified form. The modified form consisted in continuing only the calomel and carbonate of guaiacol ingredients of the pill. Later, finding that calomel given so frequently was producing sore mouth, he substituted for it minute doses of Epsom salts and continued the guaiacol. He could see no particular change in the patients under the different methods of treatment, and it was not at all probable that drugs would diminish the mortality of the disease.

Dr. A. B. Ball thought that the reason why the doctors at Bellevue had given up the bath treatment

some years ago was that they did not employ the rubbing while giving the bath. He believed a high temperature was beneficial in typhoid, tending to kill the bacilli, and that when baths were given it was often best to give them at a temperature of 85° or even 90° F.

Dr. W. P. Northrup said that at the strong recommendation of a doctor he had used in a number of cases Frankel's toxine. These patients, although recovering, suffered such great discomfort that if he were forgiven for thus allowing them to suffer, he never would repeat the offense. He thought in some cases it might be advisable to apply warmth to the extremities during the cold bath.

Dr. Louis Waldstein believed that calomel was the best drug to use in typhoid fever, especially if given early in the disease.

Dr. A. P. Dudley held that baths had no anatomical or physiological basis relative to typhoid fever. The scientific treatment was eliminative, and the bathing did not eliminate the poison. It subjected the patient to unnecessary shock and endangered the heart, whose muscular fibre was weakened by the disease. It was well known that death in this disease was usually attributed to heart failure. The treatment which he employed was citrate of magnesium to wash out the intestinal tract.

Many of us who have subjected our typhoid patients to all plans of treatment, systematic plans which have been indorsed by physicians of large experience, and unsystematic plans which we have thought suited to some special case, and have watched some of our patients get well and others die, have undoubtedly come to the same conclusion as did the editor of the *Philadelphia Polyclinic*, who sums up our present knowledge of typhoid fever and its treatment as follows:

"With good treatment and good nursing the mortality of typhoid fever should not exceed seven per cent., and, except under very unfavorable circumstances, it might be reduced to less than five per cent. In seventy-five cases out of a hundred typhoid-fever patients left to themselves without interference on the part of the physi-

cian or nurse will get well. In seventy cases out of a hundred typhoid-fever patients will survive poor medication, provided that they have good nursing. And in sixty-five cases out of a hundred they will probably survive even bad medication and bad nursing. Furthermore, the severity of the cases encountered at different times varies very greatly. Fifty or sixty cases in succession may recover with any treatment or no treatment. Three or four cases in succession may perish in spite of the best treatment. Hence, conclusions as to the comparative merits of different plans of treatment can not be drawn from any but the mass of statistics. In general, the simpler the treatment in typhoid fever the better. The less the number of drugs given the better. The less quantity of whatever single drug will answer the purpose that is taken the better. The more closely Nature is followed, and the more cautiously rash interference is shunned, the better."

Sharing these views to a great extent myself, I present for your consideration a few suggestions concerning the treatment of typhoid fever, with nothing new in the way of drugs, but only in the method of systematic administration, which I believe has never been done before.

From the hundred cases of my own above referred to, seventy were treated heroically with packs, baths, intestinal antisepsis, antipyretics, calomel, Epsom salts, and all recognized forms of treatment except the serum antitoxine, and with the average success, while the remaining thirty consecutive cases were treated much less energetically, and with only one death and one relapse.

Recognizing typhoid fever as a self-limited disease with a natural tendency toward recovery, it occurred to me that better results could be obtained in aiding Nature by maintaining the patient's strength during the period of the disease, and insuring perfect mental and physical rest, than by any other means that we could employ. In the future, with Widal's serum test, it may be possible to make a positive diagnosis of typhoid fever during the first week or ten days of the disease, but unfortunately in the past this has been impossible, and therefore equally impos-

sible to determine the value of the many so-called abortive methods of treatment.

All cases coming under my observation with symptoms which pointed toward the disease were at once ordered to bed, placed under a strictly liquid diet, and given a large dose of calomel, followed in a few hours with Epsom salts. After the bowels were thoroughly moved, one large dose of Warburg's tincture was given every morning on an empty stomach, and followed during the day with about fifteen grains of quinine in solution, given in divided doses. The majority of these patients have within a week entirely recovered, but I have not considered them as abortive cases of typhoid fever, for other cases under the same treatment have shown the characteristic symptoms of the disease apparently without this treatment having had the slightest effect.

As soon as the diagnosis of typhoid fever was established all medication was stopped, and a peptonized milk diet was ordered in three to five ounce doses every two hours, and continued as the only article of diet until convalescence was assured. When the diagnosis of the disease is made there are before the patient from two to four weeks of continued fever, great mental, nervous, and physical prostration, restlessness, and delirium. These conditions must be met and provided for. Every organ and tissue in the body has its physiological function deranged and is acting improperly. To overcome these conditions it is necessary to give nourishing but easily digested and assimilated food, proper stimulation to the depressed nervous system, and to sustain the overtaxed organs and tissues with sedatives to insure quiet and rest, so that as little work as possible may be required of them.

To meet the first indication nearly all physicians agree that a milk diet gives the best result. It seems extremely important that the milk be peptonized, for thus being partially digested artificially, it gives the digestive organs less work to do, and digestion, absorption, and assimilation are more perfectly performed. The gaseous distention of the abdomen was in the majority of my cases but slight when this diet was strictly adhered to.

To meet the second requirement, that of proper stimulation, again most physicians agree that whisky gives the best result. The quantity to be given and the frequency depend entirely upon the condition of the patient; but it should be given at once when the diagnosis is made, and continued until convalescence is thoroughly established. It is usually better to give it in water well diluted and at frequent intervals, rather than in large doses at longer intervals. In all my cases I have given it in this manner, and its results have been satisfactory, both in regard to the continued effect of the stimulant and to its being well retained by the stomach. None of the patients received less than two ounces a day, and many of them from five to eight ounces, while one patient took over a pint of whisky a day for a brief period.

To meet the third requirement, and thus insure mental and physical rest, and to lessen nervous exhaustion, morphine was used, and to it I consider my good statistics are due. It was used liberally and frequently in all the thirty cases from the time the diagnosis was positively made until the disease had run its course. Some of the patients were given it in small quantities with the whisky—never more than a sixteenth of a grain at one time—others were given it by hypodermic injection in larger doses less frequently. When it agreed with the stomach and no nausea resulted from its use it was given with the whisky; but if there was any disturbance of digestion then hypodermic injections were resorted to. The amount given during the day was enough to produce a decided physiological effect of the drug on the nervous system. The smallest amount given in one day was about a fifth of a grain, and the largest amount two grains; but if the indications had demanded it larger doses would have been given. Decided stupor and coma are contra-indications for its use, and it is therefore important that the patients under this treatment be carefully and intelligently watched. It was perhaps fortunate that nearly all my thirty cases were under the care of trained nurses, so that the symptoms could be carefully noted, and the amount of morphine intelligently given as the indications

warranted. Small doses were given at first by the mouth. If nausea, indigestion, or constipation resulted, then it was given by hypodermic injection. The dose was gradually increased in size until the respirations were slightly reduced in number and the patient remained quiet and drowsy, with a decided tendency to sleep much of the time. As the fever subsided and convalescence began the amount of morphine was gradually diminished, and stopped entirely when there was no longer any rise of temperature. In none of these cases was the morphine habit established, nor were there in any of the cases bad results or symptoms which could be attributed to the use of the drug. Constipation did not seem to be a contra-indication for its use, or a slight amount of albumin in the urine. The delirium was always quieted by it, even in cases where it was quite active, and it had a decided stimulating action on the depressed central nervous system, as shown especially in the improved condition of the heart's action and pulse.

As to the effect of morphine on the course of the disease, it apparently had no special influence. The length of the disease was not decidedly shortened in any of the cases. The milder cases ran a little shorter course than usual, and the serious cases a little longer. The temperature ran about its usual course, in one case reaching 107°, and in many of them from 104° to 105°. Diarrhœa was certainly checked in most of the cases, while constipation was produced in others. The most striking effect of the morphine was manifested on the nervous system. There was in the early part of the disease less restlessness and wakefulness, and in the latter stages less delirium and twitching; and throughout the whole disease less headache and general complaints which we so often hear. Dryness of the tongue was present about as usual, certainly not worse, while the skin was more active, perspiration being quite profuse at times, evidently aiding in the elimination of the typhoid poison.

But one patient suffered with a relapse. She was a young woman who went successfully through a serious attack of the disease, and had a normal temperature for a

few days. She then had a return of the fever with very severe diarrhœa, and died, apparently with exhaustion, in about two weeks after the relapse. A post-mortem was allowed, and on autopsy very extensive ulcerations were found in nearly the entire length of the large intestine.

Severe hæmorrhage occurred in but one case, and slight hæmorrhages in but two or three others. Most of these patients received no other medication except the morphine, the complications being treated usually without drugs, as follows: To relieve the dryness of the skin and to aid elimination and perspiration, the entire body was sponged off with tepid water once or twice a day and rubbed dry with a coarse towel, the friction acting as a strong nerve stimulant. If the stomach became irritable, and if the patient vomited, all nourishment and stimulation were given by the rectum, and the stomach allowed an absolute rest, a few teaspoonfuls of water only being given at a time to relieve thirst, until that organ was quieted. If the bowels became distended with gas, a soft-rubber rectal tube passed high into the bowel and left in position would relieve the symptoms. If constipation was present, an enema of soap and water was given, and usually with good results. If a laxative was necessary, drachm doses of Epsom salts dissolved in water and *crême de menthe* given every half hour for three doses would produce the desired result.

How to reduce the temperature in typhoid fever has long been a disputed problem to the medical profession. We have all used the numerous antipyretic coal-tar products, and most of us, I think, have discarded them as dangerous and worse than useless. I remember once calling a well-known consultant physician to see a case of typhoid fever with me. I was especially worried about the continued high temperature. It could be reduced for a few hours with some antipyretic, but would soon rise again to an alarming degree. When asked his advice he said: "Leave the temperature alone. More typhoid patients die from antipyretics than from the fever. High temperature is seldom the cause of death." I have learned

to quite agree with him, and now unless the temperature is excessive it does not alarm me.

In none of these thirty cases were antipyretics used, and in but one case was it necessary to reduce the temperature by means of cold water. This was in the case of a young woman whose temperature went up to nearly 107°, and she became comatose. In her case the wet pack was used, and in an hour the temperature fell some four or five degrees, and with the fall of temperature the comatose condition disappeared, and there was general improvement in her condition. It is reasonable to suppose that this patient would have died had her temperature not been reduced in a few hours. Patients with a temperature of from 103° to 104° seldom require a bath, and tubbing for a temperature of 102° or 103° is neither practical nor advantageous in the large majority of cases. In temperatures of 106° or over, a reduction of temperature by the extraction of heat by cold applications is necessary, but only for the same reason that it is necessary in sunstrokes, and not because it is the temperature of typhoid fever and due to a toxic poison generated in the body.

For the large hæmorrhage an ice bag was placed over the abdomen in the right iliac region, and an extra hypodermic of morphine given. The hæmorrhage did not recur. If it had, I should probably have resorted to the administration of gallic acid, and perhaps ergot, but I doubt if any internal medication given to check hæmorrhage in typhoid fever has ever been of any service. The slight attacks of hæmorrhage received no treatment.

The nervous symptoms and diarrhœa were so controlled by the morphine that no other medication was required. Should the diarrhœa be profuse, exhausting, and not controlled by the morphine, the use of subgallate or salicylate of bismuth and naphthaline would have been followed by good results.

Whether the good results here recorded from the use of morphine in enteric fever will be borne out by its further use, time alone can answer; but from my experience

it is the most satisfactory plan of treatment, both to the patient and to the physician, and with the lowest rate of mortality. Complications may arise which would demand the use of other agents, or perhaps necessitate the withholding of the morphine, but such cases would be exceptional ones.

The action of the morphine, although relieving many of the distressing symptoms of the disease, seems to act in some way as an antitoxine, and lessens the depression of the central nervous system, which is most frequently either the direct or indirect cause of death.

What may be expected from the treatment of typhoid fever in the future with antitoxine serum it is too soon to predict, but investigations are going on in this direction which may lead to good results.

With still brighter prospects for success have pathologists been experimenting with typhoid bacilli in antityphoid vaccination.

The method employed consists of inoculation of the dead typhoid bacilli.

The experiments of Wright and Semple, although not conclusive, seem to warrant the belief that persons thus vaccinated are protected against typhoid fever.

It is uncertain how long this protection lasts, but as the vaccination can be practised without risk to the life or health of the individual, revaccination can be performed whenever there is great danger of typhoid infection.

Dr. A. A. Smith said that the paper had been to him very suggestive. He was inclined to believe that the results in any one hundred cases of typhoid fever would hardly justify any positive conclusions as to the rate of mortality. In different seasons and under different conditions typhoid fever became a very different disease from what it was in others. As to the main feature of the paper—the continued and systematic use of morphine throughout the disease—he would say that while he had never used morphine in this systematic way, he had long felt that the opiates were not as objectionable as many observers were inclined to believe. He had been in the habit of using one form or other of opium

for a long time for the relief of the marked restlessness, severe headache, and muscular pains, and certainly, up to the time of the discovery of the synthetic coal-tar preparations, it had been a very great favorite with him. When he had first used the latter preparations he had been much pleased with them, but he had had his scare very early. He had followed the German suggestion of giving thirty grains of antipyrine, repeated twice at intervals of two hours. The patients had recovered, but he thought through no act of his. After that he had declined to give these antipyretics up to a very few years ago. Latterly, however, during the first week of typhoid fever he had given small doses of these agents, and had found them very satisfactory. He had been in the habit of combining the antipyretics with small doses of opium. He did not give them after the eighth day, for the reason that he had a fear, which seemed to be a well-grounded one, that these remedies were depressing. He gave them, not for the reduction of temperature, but for the relief of certain very unpleasant symptoms. His fears regarding their very depressing effects had been removed.

He had also been interested in the remarks made by the reader of the paper regarding intestinal hæmorrhage. Like many others he had used the various astringents, but he had long ago given them up; he relied now almost exclusively upon morphine for intestinal hæmorrhage. He was opposed to the application of an ice-bag or cold coil to the abdomen in cases of intestinal hæmorrhage, and he thought he had seen intestinal hæmorrhage recur as a result of the application of cold, although, of course, such a statement did not admit of proof. He gave morphine in moderate doses by hypodermic injection.

Another interesting point in connection with the treatment of typhoid fever was that of the abortion of the disease. Probably we were all trying to do this, yet he did not believe that there was any evidence whatever that by any method of treatment typhoid fever was capable of being aborted. We all saw cases of typhoid fever which ran a short course. He hoped that we might in the future have a serum treatment which would accomplish something in this direction.

The reader of the paper had accepted the statement that many cases of typhoid fever would do very well if not meddled with, and to this he heartily agreed—there was far too much meddlesome treatment of this disease. In hospital practice one saw many patients who had had

no treatment—not even dietetic—for the first two weeks of the disease, and which did very well. Usually within forty-eight hours after admission the high temperature would subside, and the subsequent course of the disease would be very satisfactory. Two or three years ago he had seen a patient who had lain out on a lumber pile for two nights in his delirium, and who had walked into the hospital suffering from typhoid fever. So far as could be ascertained he had been in the second week of the disease, yet he had made an excellent recovery.

Regarding the question of what the temperature should be before the application of baths, Dr. Smith said that there had been a too arbitrary standard established. In some of the hospitals it was the routine treatment to bathe the patient regularly if the temperature were above 103° or 103.5° F. This should be a matter to be decided upon in the individual case, the physician being guided by the condition of the nervous system, the skin, and the circulatory system. In hospital practice it was comparatively easy to have the patients bathed, but we could not be so arbitrary in private practice. He had tried in private practice nearly all of the methods of bathing, yet he had felt that oftentimes he would have succeeded fully as well if he had used only the more simple methods of bathing, instead of giving tub baths. Up to three years ago he had followed in the hospital the plan of immersion and frictions, according to the Brand method. In the past three years, under the belief that the method was too difficult for general adoption in private practice, he had adopted the "bed bath." Certainly, the results in these three years had been fully as good as in the preceding three years. The treatment was much more easily carried out, and with very much less expense. He had seen very good results from the application of sheets dipped in water, and from pieces of ice passed over the patient. The greatest danger was not from the high temperature, but from the depression of nerve force, and hence, whatever agents would sustain that nerve force through a certain period would add to the favorable progress of the disease. In private practice one often met with strenuous objections to the bath treatment. It was then necessary to resort to such measures as the use of the ice-cap or coil. According to his experience, it was not the patient, but the friends of the patient, that gave the physician the most care and concern in their therapeutic efforts.

Dr. Egbert le Fevre said that we should consider

the nature of typhoid fever. When first called, the case was usually well advanced; hence, any treatment directed to the abortion of the disease would appear to be entirely useless. Looking over the pathological findings in cases of typhoid fever one must be struck with the fact that the disease was one of two weeks' duration. After the incubation, there were involvement of the glands and enlargement of the spleen, followed by a general intoxication. In many cases the disease ran a two weeks' course and recovery took place. Most of the cases, however, were more protracted, and then there was developed a septic temperature. This was apparently the result of the typhoid infection, and was not part and parcel of the disease itself. In two weeks the system usually overcame the disease, and left a condition similar to that found in the lung after the crisis of a pneumonia. Our treatment during the first two weeks was, therefore, all important, as tending to limit the amount of cell infiltration, and so reduce the liability to accidents in the third and fourth weeks. For these reasons he favored the so-called eliminative treatment at the beginning, by the use of small doses of calomel. This should be adopted in all suspected cases. From some observations that he had made with the stomach tube he had come to believe that we often gave too much for the digestive power of the patient. In most cases the mineral acid was deficient, and hence he now made it a rule to administer from five to ten drops, every four hours, of dilute hydrochloric acid, as an aid to digestion. Lack of attention to this point was often the cause of the intestinal fermentation and tympanites. It seemed to him very important also to insist upon the administration of large quantities of water. Examination of the urine would show the necessity for this form of eliminative treatment. He directed that the patient should receive at least eighty ounces of fluid, but preferred that even a larger quantity should be taken daily. He felt sure that this alone brought about a reduction in temperature and a favorable modification of all the symptoms.

It had been his custom to withhold stimulants, particularly whisky, until the later stages of the disease. When the nervous system flagged he used strychnine, rather than the diffusible stimulants. He would indorse all that had been said by the last speaker about the bath treatment. We had been unduly scared by high temperatures, and the extreme bath treatment tended rather

to exhaust than to support the patient. He had not used the opium treatment, and was not inclined to look upon it favorably, for the reason that it must tend to confine the bowels and retard elimination.

Dr. Floyd M. Crandall said that he agreed very thoroughly with the reader of the paper regarding the advisability of using a simple method of treatment. He found that high temperature bothered him much less now than formerly. He was at present treating a case of typhoid fever that had reached the twenty-sixth day, and the temperature chart indicated a fairly severe form of the disease; but there had been no complications, and he had made no effort to reduce the temperature. Since the tenth day the patient had only received strychnine. He also avoided the early use of stimulants. It seemed to him that one of the chief results of the Brand method of treatment in private practice was to send these patients to the homœopaths. He had almost entirely abandoned the intestinal antiseptic treatment, for he did not believe we possessed any safe and efficient intestinal antiseptics. He now used moderate doses of the coal-tar products in the first week of the disease for the relief of pain and restlessness, but not in antipyretic doses. He believed that this practice was safe as well as satisfactory.

Dr. W. H. Katzenbach said that the early diagnosis of typhoid fever was of much importance. The disease began in a number of different ways. One variety was ushered in with cerebro-spinal symptoms, and with considerable delirium. Here we were justified in using the opiates, or the coal-tar antipyretics, or the two combined. He was opposed to the use of internal antipyretics after the first week. Typhoid fever often began as an acute disease, and we were compelled to make a careful differential diagnosis. We sometimes found chill, fever, and sweating, and enlargement of the spleen, thus leading to the suspicion of paludal fever. The disposition of physicians at the present time seemed to be in all the acute infectious diseases to give an initial dose of calomel, and this treatment seemed to be a very rational one, as it removed whatever toxines or ptomaines happened to be present in the intestinal canal. The prognosis in typhoid fever depended very largely upon absolute quiet and good nursing, given to the patient in the first week. The sick room should be large and sunny; it was also desirable to have two beds, so that the patient could be easily changed from one to the other. The friends should be kept out of the way, and letters and family

matters should be kept from the patient, so as not to unduly excite the nervous system. These small details were of importance, and if attended to would often make it unnecessary to use opiates. It had not been his practice to use opiates, as a rule, but when it had seemed necessary he had preferred codeine. He was accustomed to sterilize or scald the milk, and to dilute it with plain water or Vichy water. The free administration of water was also useful. He had ordinarily used the pack, or had sponged the patient with water at 70° or 80° F. for the reduction of temperature. After the sponging the patient should be thoroughly rubbed. During the sponging, it should be remembered, the patient should be exposed, and not sponged, as nurses were prone to do, under the bed clothing. Unless the patient was stripped and thoroughly exposed to the air such sponging was practically useless. Often after the sponging the patient complained of cold hands and feet, and then it was well to apply hot-water bags to the extremities, and administer alcohol or nitroglycerin to improve the circulation.

Dr. CUTLER said that he also approved of the administration of large quantities of water. It was his practice to give whisky very thoroughly diluted, but he preferred to give it early in the disease in small quantities, and to increase it as the system seemed to demand. His reason for doing this was to anticipate the exhaustion consequent upon such a long sickness. The alcohol seemed to him to lessen tissue change and aid digestion. He had given strychnine in many cases, but not so much lately. He thought it had a tendency to increase the delirium, or the headache and pain, of which these patients often complained.

Meeting of April 7, 1897.

The President, Dr. LUCIUS W. HOTCHKISS, in the Chair.

Extirpation of a Retrosternal Tumor of the Thyreoid.—Dr. A. B. JOHNSON presented a woman from whom he had removed such a growth. She was a German, thirty-five years of age. Eleven years ago a slight fullness had appeared on the right side of the neck, corresponding to the situation of the right lobe of the thyreoid gland. This had gradually increased in size, and

during the last six weeks had caused grave symptoms. She had suffered from pain, hoarseness, and cough, associated with expectoration of mucus. Of late, there had been attacks of alarming dyspnœa, aggravated by exertion and the recumbent position. There had also been some difficulty in swallowing. The patient had been nervous and had suffered from headache and attacks of syncope. There had been no palpitation, and no exophthalmia. Examination had shown the patient to be fairly nourished; the right external jugular vein moderately dilated; the tumor extending from the level of the upper border of the thyreoid cartilage downward behind the sternum, and from the posterior border of the sterno-mastoid to the anterior border of the opposite muscle. The skin over the tumor had been normal and freely movable. The tumor had been smooth, rounded, tense, and elastic, and had moved up and down with the larynx. The right carotid artery had been displaced outward. On auscultation of the tumor there had been heard a soft but distinct systolic murmur. On March 15, 1897, under ether, an incision had been made from the angle of the jaw obliquely downward and inward to the median line, at the level of the upper border of the thyreoid cartilage, and thence vertically downward to half an inch below the sternal notch. The sternolaryngeal muscles above had then been divided, the muscles of the opposite side and below separated, and the enlarged right lobe of the thyreoid exposed. The tumor had been separated easily from the surrounding tissues by blunt dissection. The thyreoid arteries, together with the superior, middle, and inferior thyreoid veins, had been cut between double ligatures. The elevation of the growth from behind the sternum had been easily accomplished with the fingers, and the whole mass rotated toward the sound side, care being taken not to injure the recurrent laryngeal nerve. The tumor had extended downward about two inches below the upper border of the sternum. The isthmus had been of some thickness, and had been tied with heavy catgut. The deeper structures had been sutured with catgut, and the skin with silk, and the lower end of the wound had been left open. Sterile gauze had been used to fill the space behind the sternum. The loss of blood had been small, and at the close of the operation the patient had been in good condition. After the cutting off of the blood supply of the tumor it had diminished greatly in size, so that after removal it had measured three inches

and a half by two inches and a half by one inch. The surface had been somewhat irregular from the presence of numerous small cysts, and the cut section had showed many small cysts, filled with blood-stained serum, together with gland tissue, interstitial hæmorrhage, and bands of firm, almost cartilaginous, fibrous tissue. The highest temperature and pulse had occurred immediately after operation—100.8° F., and pulse, 102. For three days following the operation there had been a good deal of oozing of blood-stained serum. On the fourth day the temperature and pulse had reached the normal, and the discharge had greatly diminished. At the end of a week the sutures had been removed, and the wound had been found healed except for a small granulating area at the lower angle. The patient had been discharged well on the thirteenth day after operation. The hoarseness, dyspnœa, and cough had disappeared.

Avulsion of Biceps Tendon from the Radius.—Dr. Johnson also presented a report of a case of this kind occurring in a patient who had been admitted to Roosevelt Hospital February 1, 1897. One week previously, while lifting some heavy iron pipes, he had felt and heard a distinct snap at the elbow, and at the same time the arm had become powerless. Pain, tenderness, and swelling had followed. On examination, the patient had been found to be a muscular man. The anterior aspect of the right elbow had presented a slight fullness above the joint. On palpation, a rounded, hard mass, of the size of the last joint of a man's thumb, could be felt on the anterior and internal aspect of the arm, about two inches above the joint. This mass had been movable and apparently continuous above with the biceps muscle. The movements of the elbow had been perfect, but flexion had been very feeble. On February 9th a median incision had been made in front of the bend of the elbow, and the hard mass had been found to consist of the ragged end of the ruptured biceps tendon covered with fibrin. The torn end had been trimmed smooth, and sutured to the periosteum on either side of the tuberosity of the radius. Two heavy catgut sutures had also been passed through the tendon an inch from its end and firmly tied to the muscles and fascia on either side. The arm had been flexed to less than a right angle and supinated, and the sutures tied in such a way that the end of the tendon had remained in contact with the tuberosity of the radius without tension. The wound had been drained with rubber and closed, a light plaster

dressing being applied over the sterile dressing, and the arm strongly flexed and the forearm supinated. The dressing had been removed on the fourteenth day and the wound had been found to be healed. The arm had been kept in plaster for six weeks, and for two weeks longer in a light starch bandage. At this time, moderately free use of the arm had been allowed. At the present time, flexion seemed to be done by the biceps with good force.

Cured Popliteal Aneurysm.—Dr. JOHNSON then exhibited a man, twenty-six years of age, who had been admitted to Roosevelt Hospital on February 10th, with no history of injury. He had denied syphilis. Since December, 1895, he had had increasing pain and stiffness in the left knee. Seven months ago he had first noticed a lump in the middle of the left popliteal space, which had steadily increased to its present size. This had been accompanied by such severe pain that he had been obliged three months ago to give up work. Examination had shown in the left popliteal space a rounded oblong tumor, with the long diameter vertical. It had measured three inches and a half by two inches and a half; had been smooth, tense, and elastic, and had not been attached to the overlying skin. There had been an expansive pulsation in the mass, synchronous with the heart-beats. Palpation had detected a thrill, and auscultation a loud, blowing, systolic murmur. Compression of the femoral artery had caused a cessation of pulsation and thrill and murmur, and pressure had caused a diminution in the size of the tumor. On relaxing the pressure the tumor had become larger, and the other signs had returned. Pulsation in the left anterior tibial had been delayed, and had been more feeble than in the opposite limb. Active flexion of the knee joint had been slightly diminished on the left side. On February 13th, under ether, the superficial femoral had been divided between double ligatures at the apex of Scarpa's triangle. The wound had healed by primary union, and the nutrition of the limb had remained good, but the patient had suffered much pain in the leg and thigh, and there had been numbness of the foot. Much of the pain had been along the trunk and in the distribution of the sciatic nerve. The sac was a little smaller and firmer, and without pulsation.

Webbed Fingers.—Dr. JOHNSON next presented a case of bilateral webbed fingers in a boy of five years. There had been no family history of congenital deformi-

ties. On the right hand, the little finger for one half its length had been united to the ring finger by a thin web of skin, and the index and middle fingers had been in the same condition. The middle and ring fingers had been firmly united throughout their entire length, and the skin of the palmar surface had showed no furrow. The finger tips had showed only a slight sign of division, and the finger nails had been continuous, forming one broad nail. The thumb had been free. The second and third phalanges of the middle and ring fingers had been partly flexed, and could not be completely extended. On February 10th he had operated by very freely splitting the tissues down to the normal limit, and then applying Thiersch skin grafts to the raw surfaces. The hand had been put up on a palmar splint. Healing had been perfect except for a spot in the angle between two of the fingers. The result promised to be very satisfactory.

A Cyst of the Thyreoid Gland.—Dr. Parker Syms presented a cyst of the thyreoid gland, which had been removed from a man sixty years of age. There had been a distinct history of his having suffered from enlargement of the thyreoid gland for about twenty-five years. The enlargement had been progressive, and for the last two or three years had caused serious inconvenience by interference with respiration. There had been no evidence of pressure on the laryngeal nerve, but the larynx had been displaced by the pressure, and he had not been able to sleep in the recumbent position. He had been operated upon two weeks ago through a median incision, four inches long, supplemented by a transverse incision extending from the upper part of the first incision a distance of about three inches. The principal difficulty had arisen from the fact that the man was stout and the neck exceedingly short. The tumor had been very readily exposed, after dividing the superficial structures and the muscles, and, on passing through the thin mantle of the thyreoid, the cyst itself had been reached, and had been enucleated without difficulty. None of the thyreoid had been removed. The wound had been sutured except at the lower part of the median incision, where the deep cavity had been packed. The packing had been removed after about seventy hours. Recovery had been uneventful, and the trachea and larynx had regained their natural position.

Dr. J. W. S. Gouley said that the cases suited for excision were those in which the growths were not purely cystic, but contained some solid matter. He had done

the operation once on a tumor of moderate size. This tumor had been solid, and had consisted of the right lobe of the thyreoid gland. The operation had not been difficult. The small cysts, he thought, were curable by the use of irritating injections. He had succeeded by injecting absolute alcohol into the sac, after emptying it. In one case, a patient of Dr. Charles Phelps's, the cyst of the thyreoid gland had interfered somewhat with breathing, and, at his suggestion, two such injections had been given with successful result. But he had dissected out multilocular cysts of the thyreoid that he was sure could not have been treated successfully by this injection method, and he had been astounded at the vascularity of the walls of some of these cysts.

Dr. Robert T. Morris cited a case in which a very small thyreoid cyst had developed rapidly in connection with symptoms of myxœdema, except that the muscles had not been thickened. Microscopical examination of the cyst had shown the contents to be brown thyreoid material.

Dr. W. J. Chandler, of South Orange, N. J., referring to the case of aneurysm, said that about three weeks ago he had seen a case of femoral aneurysm in which the contents had already escaped into the subcutaneous tissues. The sac had been cut into and extirpated. The patient had received eighty grains of iodide of potassium daily for five days before operation. The pulsation, which had been very distinct, at the time of operation had ceased. On cutting into the sac it had been found that the collateral circulation had been so well established that hæmorrhage from the distal as well as the proximal end of the femoral was very severe, although there had been a ligature on the external iliac. In this case he had used with much satisfaction Grad's ligature, which consisted in placing under each knot a strand of silk, so placed that by drawing upon these strands the knot might be untied and the whole ligature removed. The ligature had been removed in this way ten days after the operation.

Dr. L. W. Hubbard asked if Dr. Johnson expected the tumor to grow smaller, and if in the event of its interfering with the knee joint would it not be possible to extirpate the tumor.

Dr. Johnson replied that he did not think it would interfere with the knee joint, because it had been larger at the time of the operation than now, and yet the knee-joint motion had not been impaired. However, if this

should occur, or if the pain should continue, there would be no objection to extirpating the tumor.

Death from Infection by the Bacillus Aerogenes Capsulatus following External Perineal Urethrotomy.—Dr. Thomas A. Smith presented the following history of such a case:

James F., aged thirty-three years, was admitted to Bellevue Hospital on the 6th of May, 1896, suffering from much pain and difficulty in micturition. He had had two attacks of urethritis—the first seven years ago, the second about three years ago. For five months prior to his admission he had had some difficulty in urinating. A dense, narrow stricture had been detected in the perineal region of the urethra which, after much difficulty, had been dilated to No. 13 (English gauge). He had then been lost sight of until November 23, 1896, when he had returned to the hospital in the same critical state as before. All attempts to pass the stricture having failed, on December 5th external perineal urethrotomy had been performed by Dr. Gouley, and a drainage catheter left in the bladder through the wound. The two following days, December 6th and 7th, the bladder had been irrigated at regular intervals. His urine had been perfectly clear; his temperature had not varied from 99° F.; he had had no pain, and had been in excellent spirits. On Tuesday, December 8th, a No. 12 (English) sound had been passed down to the site of the stricture and the point of the instrument brought out through the perineal wound, causing some hæmorrhage from the granulations. The bladder had been irrigated and the drainage catheter removed. That evening he had passed his urine, some escaping through the perineal wound, but most of it through the urethra, and next morning sixteen ounces more had passed through the perineal wound. That morning, December 9th, he had had a very severe chill, his temperature rising to 105° F. within two hours. His face had been flushed and anxious; his tongue coated; his pulse rapid and irregular; there had been nausea and vomiting. He had not complained of headache, but in the afternoon had had intense pains in the back and limbs, particularly about the joints. During the night his temperature had been above 103° F. He had complained of great general pain. For about an hour he had been somewhat delirious, but after that his mind had seemed perfectly clear throughout. He had passed six ounces of urine early in the evening. The next day his tem-

perature had remained high, and it had been evident that he was very much worse. His pulse had been weak, irregular, and rapid, and he had suffered intensely from pain in his back and about his shoulders, hips, and knees. In the afternoon there had been an area of two inches of subcutaneous emphysema, which was just above the right knee joint, and within an hour this area had increased in extent, involving the whole of the front of the thigh. Later the skin over this had appeared mottled and of a bluish color. Other areas of emphysema had soon appeared on different parts of the body. As the emphysema increased the man had complained less of pain; his pulse, however, had been then almost imperceptible. At eight o'clock that evening he had died, conscious to within a few moments of his death, having passed in all, at one time, six ounces of urine. At once the emphysema had spread very rapidly, and in an hour had covered almost the entire body.

Of the post-mortem examination the following notes had been kindly furnished by Dr. Jeffries: "General examination shows subcutaneous emphysema over the entire body. Greenish discoloration over the thorax, right thigh, and posterior surface of body, marked over the penis, scrotum, and anus. Puncture of emphysematous areas permits the escape of a gas smelling of hydrogen sulphide and burning with a faint blue flame. There was emphysema of the connective tissues over the thorax and abdomen. The muscles were soft and pulpy. The blood was dark and fluid. There were emphysematous areas over the pericardium and pleura, the visceral pericardium being emphysematous throughout. The entire liver was emphysematous. The bladder contained a small amount of turbid urine; its wall was thickened, the mucosa being extremely emphysematous. A microscopical examination of smears made from the various viscera demonstrates the presence of a seemingly pure culture of a large encapsulated bacillus. A bacterial examination of cultures made from the same organs demonstrates this bacillus to be the *Bacillus aerogenes capsulatus*."

In this case the point of infection by the bacillus would appear to be the perineal wound, and at the time of the passing of the sound less than twenty-four hours before the chill.

The main points of the disease, as presented by this single case, would seem to be: 1. The sudden onset, with high fever and great prostration, but no delirium.

2. The severe general pains, particularly about the larger joints.

3. The almost complete suppression of urine.

4. The general subcutaneous emphysema with bluish mottling of the skin.

5. That consciousness was retained to within a few moments of death.

Dr. GOULEY said that at first the case had seemed to him entirely new, but he had recalled a similar instance of sudden death after a severe railway injury. In that case the whole body had become emphysematous. Of course, at that time, about twenty-five years ago, nothing had been known of this bacillus. There had been one or two other cases at Bellevue Hospital, and several had also been reported from the Johns Hopkins Hospital in Baltimore.

The PRESIDENT said that he had lately had a very similar case—one of external urethrotomy for stricture—which had run an aseptic course up to the fifth day. At this time a sound had been passed into the bladder, and shortly afterward the man had had a severe chill and a temperature of 105° F. He had died within thirty-six hours. Immediately after the seizure he had developed an emphysematous spot on the right buttock and on the shoulder, opposite the points of pressure. There had been no emphysema about the perineal wound, and the latter had appeared absolutely healthy. A specimen taken from the emphysematous areas before death had given a perfectly pure culture of this bacillus. He believed this case had been reported by Dr. Dunham in the *Johns Hopkins Hospital Bulletin*. A culture from the deep urethra after death had also revealed these bacilli. It had been presumed that the infection had taken place at the time of the passage of the sound. The speaker recalled another case, seen at Bellevue Hospital, which had been transferred from one of the other hospitals. He had refused operation on a tight stricture of the urethra, but had had a sound passed upon him just before admission to Bellevue Hospital. On entering the latter hospital he had developed a gaseous tumor in the groin and in the back. These had been incised, and some bloody serous matter evacuated. This patient had died in a day or two, and the autopsy had shown nothing but a collection of blood-stained fluid containing gas, which had passed up through the tissues behind the colon, and which had seemed to be connected with a slight lesion in the urethra.

A Skin Lesion Occurring with Gonorrhœal Septicæmia.—Dr. ROBERT T. MORRIS exhibited photographs and made a report of the following case: The patient, a man of twenty-five years, had contracted gonorrhœa in July, 1895. This had been followed by stricture and gleet. He had developed gonorrhœal septicæmia in the following year. Shortly after this had begun, one joint after another had become involved, and in about three weeks skin lesions had appeared on the lower part of the leg, forearms, and feet. These had consisted of round "craters," involving, apparently, the whole thickness of the true skin, and giving to it a punctured appearance. This had been surrounded by an area of hypertrophic and reddened skin. In the next year these lesions had increased to fifteen in number. In October, 1896, the patient had been in bad condition. At that time the speaker had divided the stricture, and had made deep injections of nitrate of silver into the urethra. Very shortly after that the skin lesions and the evidence of gonorrhœal septicæmia had begun to disappear. At the present time there was no arthritis; he had gained about twenty pounds, and all but one of the skin lesions had completely healed. Scrapings had been taken from the skin lesions while they had been in process of healing, but examination had failed to show any gonococci.

Paper.

A LARGE ANGEIOMA OF THE LIP. A SKIN LESION OCCURRING WITH GONORRHŒAL SEPTICÆMIA. A CYST OF THE PALM.

By ROBERT T. MORRIS, M. D.

Angeioma of the Lip.—John T., aged thirty-two years, was brought to New York in November, 1895, by his physician, Dr. J. L. Polk, of Arcola, Illinois. The patient at birth had a small nævus of the upper lip, which was not very important until 1884, when an attempt at removing it was made in Chicago. After the operation the neoma increased rapidly in size. In 1892, in Terre Haute, another operation was done by the plan of removing the growth in sections, but this operation was not carried to a finish on account of hæmorrhage. In the same year, in St. Louis, setons were introduced through the lip, as many as thirty-five being employed simultaneously. This treatment stimulated the development

of the tumor, and it increased in size very rapidly, taking on a malignant appearance.

When I saw the patient, in November, 1895, the tumor was a large, purplish, heaving mass, which pulsated so strongly that it seemed to be on the point of bursting with every heart beat. The tumor had its origin at the site of the upper lip, but it hung below the chin, so that the patient had to lift it with one hand in order to get food into his mouth. I planned to ligate both external carotid arteries as a preliminary step before

FIG. 1.

operating upon the lip, but two of my assistants seemed to control the circulation so well by hand pressure that I depended upon that resource. The first incision into the mass was followed by such a torrent of blood that it was evident that the patient would die upon the table in a few moments. There was no time to ligate the carotids,

so I instantly thrust a scalpel entirely through the base of the tumor, leaving the blade on one side and the handle on the other, to serve as a holding post for a bandage which was tied so firmly about the base of the tumor that all hæmorrhage ceased. The tumor was then cut away, leaving the scalpel and bandage in place for a week. At the end of that time all of the stump of the tumor had become sphacelated, and it was safely trimmed away with scissors, leaving normal tissues quite clean. As soon as the granulating surfaces had healed, a new lip was made by taking skin flaps from the cheeks, and this promised a pretty result until new angeioma developed suddenly at a suture and spread so rapidly

Fig. 2.

that in less than a month a bluish pulsating tumor, similar to the original growth, had extended out upon the cheeks. The case was thought to be hopeless, but Dr. W. B. Coley began injection with toxines and the tumor soon diminished in size, and finally became stationary and small, but presenting, nevertheless, the color and general look of the original growth, although with much less pulsation. A small section of the tumor was examined at this time by Dr. H. T. Brooks, who had made the micro-

scopical examination of the original tumor. Dr. Brooks found that the neoma was still angeioma, though it was slowly diminishing in size. The patient returned to his home in Illinois, and Dr. Polk wrote me that the evidences of disease slowly disappeared and the patient became perfectly well. One of the accompanying photographs (Fig. 1) shows the original tumor before operation. The other photograph (Fig. 2), taken a year later, shows the result of treatment.

FIG. 3.

A Skin Lesion occurring with Gonorrhœal Septicæmia.—A man, aged twenty-five years, patient of Dr. T. D. Rupert, of Geneva, N. Y., contracted gonorrhœa in July, 1895. In October of the same year, gonorrhœal septicæmia caused arthritis, which shortly disappeared. In

the following September (1896) the arthritis again became progressive, and the nuchal fibrous tissues were also involved. The arthritis involved at different times ankle, wrist, elbow, shoulder, knee, and hip joints. The patient became very anæmic, and the right epididymis suppurated. The skin lesions appeared in October, 1896, and affected the calf, ankle, dorsum of foot, and forearm—both right and left extremities about equally involved. Each lesion appeared at first as an indurated, painful, red blotch, and in the centre of the blotch an ulcerating crater formed, quite round, with sharply defined edges, and evidently penetrating the entire thickness of the skin. The discharge from each crater was sanious. The craters varied from about five millimetres in diameter to about twenty-five millimetres in diameter. One after another formed, until there were fifteen in all (syphilis was excluded in diagnosis). In January, 1897, I removed the suppurating testicle, and cut a stricture of the urethra. Subsequent treatment of the infected focus behind the stricture region in the urethra was carried out by Dr. Rupert. The patient at once began to recover from his anæmia, arthritis, and skin lesions, and at the

Fig. 4.

present writing, April, 1897, there remains only a little tenosynovitis near the left wrist and an occasional twinge of pain in the nuchal region. The craters have all healed with the exception of a sinus from burrowing discharges in one. Crops of papules form in clusters near the old

crater sites. Each papule is about as large around as a lentil, and is marked by scaly desquamation of surface epithelium. Scrapings from the craters were examined for gonococci, but this was not done until the craters had all begun to heal, and we found only a number of mixed bacteria without gonococci. Two photographs (Figs. 3 and 4) are presented to show the crater skin lesions.

A Cyst of the Palm.—Miss S., aged fifty-two years. For fifteen years has noticed a slowly developing painless tumor situated to the right of the left thenar eminence. She thinks that a very small nodule had existed at that site for many years previously. Within the past two years slowly developing "cold abscesses" have formed at the anterior surface of the left carpus. The accompanying photograph shows the tumor and one "cold abscess." I removed the cyst and opened the

Fig. 5.

abscess. The abscess pus contained streptococci, but no tubercle bacilli or actinomycosis rays. The fluid from the cyst, viscid and nearly transparent, was not examined, but the cyst wall was found on examination to consist of nothing but connective tissues. The tumor was probably a thecal retention cyst.

A Congenital Cyst of the Hand.—Dr. Morris also reported a case of this kind. The cyst had started near the thenar eminence, and had slowly developed during a period of at least thirteen years. Recently two more acute collections of fluid had formed on the opposite

side of the palm. The cyst had been larger than a pigeon's egg, and had contained material like white of egg.

Dr. GOULEY said that it was known that sarcomata after injections of any kind, or after operations, might undergo a fibroid change—in other words, that there was a progressive metamorphosis instead of a retrogressive or malignant process. He had seen sarcomata recur, and then begin to harden and decrease in size. The operation itself had seemed to be responsible for this change.

Paper.

A STUDY OF TETANUS AND ITS TREATMENT.

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STATISTICS.—Since the advent of antiseptic surgery tetanus has become less common than before, and is now usually considered a rare disease. That it is, however, of more frequent occurrence in New York city than is generally supposed is shown by the following table of deaths from tetanus, taken from the records of the Bureau of Vital Statistics for New York city.

Record of the Deaths from Tetanus in New York City from 1868–'96.

	TETANUS NEONATORUM.				IDIOPATHIC TETANUS.			
	Male.	Female.	Total.	Average.	Male.	Female.	Total.	Average.
1868–'77.....	278	193	471	47·1	52	24	76	7·6
1878–'87.....	305	202	507	50·7	16	9	25	2·5
1888–'96.....	219	144	363	40·3	31	21	52	5·7

The foregoing statistics of tetanus neonatorum may be considered as accurately representing the death-rate from that form of tetanus; while the statistics of idiopathic tetanus show a less number of deaths than actually occurred from traumatic tetanus. This is because in all cases of traumatism in which death occurred from tetanus the record of death was placed under the accident which caused the trauma. These figures, therefore, represent

only the number of deaths from the so-called idiopathic and rheumatic tetanus—that is, those cases in which the lesion giving rise to the infection was either overlooked or had healed and could not be found. The death-rate in tetanus neonatorum is usually estimated as from ninety to ninety-five per cent. (1); therefore, the number of cases from this disease in children in the last twenty-nine years has amounted to about fourteen hundred and fifty, or fifty a year. Counting the traumatic cases, it seems a safe estimate to say that in this city there have averaged about sixty cases of tetanus a year for the past twenty-nine years.

The Tetanus Bacillus.—The tetanus bacillus is now accepted as being the cause of all the various so-called forms of tetanus, such as puerperal tetanus, tetanus neonatorum, idiopathic, rheumatic, and traumatic tetanus. To produce the disease there must always be some wound in which the bacillus finds lodgment. The bacillus itself is a slender, round-ended rod, usually occurring singly, but in cultures often growing in long threads. In its resistant stage it contains a round spore at one end. It will not grow at temperatures below 14° C., but grows at ordinary temperatures of 20 to 22° C., and best at body temperature of 37° C. It will not grow in the presence of oxygen, but is a strict anaerobe. Its growth in the animal organism is comparatively scanty, and is usually in association with other germs. It remains at the seat of infection, and does not spread through the body. The disease is a true toxæmia. The spores are very resistant to external influences. Henrijean (2), by means of a splinter of wood which had once caused tetanus, was able after eleven years to again cause the disease by inoculating an animal with the same splinter.

The Occurrence of Tetanus Bacilli in Nature.—Since Nicolaier, in 1884, discovered and identified the tetanus bacillus as the cause of tetanus, the bacilli have been found not only to be exceedingly common inhabitants of the soil, but when present even being as abundant at the depth of six or seven feet as in the superficial layers (3). They have also been found in many different

substances and places—in hay dust (4), in horse and cow manure (5), in the mortar of old masonry (6), in the dust from horses' hair (7), in the dust in rooms of houses, barracks, and hospitals (8), in the air (9), in spider webs (10), in the water of the Dead Sea (11). Ledantec (12) has proved that the arrow poison of certain savages in the New Hebrides is made by smearing the arrowhead with dirt from crab holes in the swamps, and thus infecting the head with the spores of malignant œdema and tetanus.

It is well known that certain localities in the vicinity of New York are notorious for the number of cases of tetanus which develop from slight wounds—for example, some parts of Long Island and New Jersey. The writer has obtained tetanus bacilli from the dirt from various parts of Long Island and New Jersey as well as from the dirt of New York streets. Dr. Williams, of the New York Health Department, has twice obtained them from air in this city.

Factors favoring Tetanus Infection.—Considering the wide distribution of the germs, why does not tetanus occur more frequently? The work of Vaillard, Vincent (13), and Rouget (14), corroborated in the main by Klipstein (15), throws some light on the subject. These authors found that pure cultures of tetanus, after the germs had sporulated and the toxines had been destroyed by heat, could be injected into animals without producing tetanus. Even one or two millions of spores, if deprived of the toxines, proved harmless to guinea-pigs, and from fifteen to thirty cubic centimetres of broth cultures were harmless to rabbits. But if a culture of a non-pathogenic organism, such as the *Bacillus prodigiosus*, was injected simultaneously with the spores, or if there was an effusion of blood at the point of injection, or if there was a previous bruising of the tissues, the animals surely died of tetanus.

Even irritating foreign bodies were introduced simultaneously with the spores deprived of their toxine and tetanus did not develop. But if the wounds containing the foreign bodies became infected with extraneous germs,

tetanus developed and the animals died; or if the spores were protected by filter paper, or even by such a soft substance as agar jelly, the animals invariably died. Because, as was assumed, the phagocytes were prevented from attacking them, they thus had time to germinate, and the bacilli formed from them were able to produce their toxines. The pus from several cases of human tetanus was injected into animals, and both the tetanus bacillus and each separate species of germs were cultivated out in pure cultures. A pure culture of each germ was mixed with the non-toxic spores and injected into animals. The majority of the animals did not have tetanus; only certain species of germs favored the development of the spores and produced tetanus. In some cases the species was found to be a bacillus, in others a coccus; in one case none of the bacilli or cocci alone favored the development of the tetanus spores, but it was necessary to inject a mixture of one of the bacilli and one of the cocci with the spores before tetanus could be produced. From these experiments it seems that a mixed infection is necessary to the development of tetanus when the infection is produced by spores.

As a matter of fact, in human tetanus the infection may be considered as probably universally produced by the germs in their spore state. If in any given case, the tissue being healthy, the ordinary saprophytic germs are killed by proper disinfection, a mixed infection does not take place, and tetanus will not develop. Or, if the germs happening to be present, even if not killed by disinfection, do not favor the development of the spores, either by interfering with the integrity of the tissues or in some other way, tetanus will not develop. If, however, the tissues infected be badly bruised or lacerated, the spores may develop, as in the experiment on animals with previously bruised tissues. This conception of the importance of concurrent infection is still further supported by experimental data. It has long been noticed that direct infection from animal to animal with pus from wounds causing tetanus could not be carried beyond the third or fourth generation. The third or fourth animal would

not become tetanic or would acquire only local and passing tetanus. Vaillard and Rouget (16) infected animals with earth known to contain tetanus spores, and counted the number of colonies developing in a given amount of the pus in each successive animal. In the animal infected with earth some thousands or hundreds of colonies were obtained, in the next animal scarcely a hundred colonies, and the pus from the third animal failed to produce tetanus. For example:

Guinea-pig 1, inoculated with earth, died of tetanus in five days; pus gave 32,570 colonies.

Guinea-pig 2, inoculated with pus from No. 1, died in thirty-six hours; pus gave 120 colonies.

Guinea-pig 3, inoculated with pus from No. 2, died in forty hours; pus gave 7 colonies.

Guinea-pig 4, inoculated with pus from No. 3, did not have tetanus.

The writer, as well as many other workers, has several times repeated these experiments with similar results. The micro-organisms which enhance the infective capacity of the tetanus bacilli, being usually saprophytic, can not be indefinitely transmitted from one animal to another, but soon die out, leaving the tetanus germs without favoring assistance, and these are thus unable to proliferate and produce their death-dealing toxines. Thus, in spite of the wide distribution of the tetanus germs, they seem to require some favoring condition of the wound or some favoring concurrent infection to enable them to grow in the animal organism.

Localization of Tetanus Bacilli in the Body.—Another factor in the case is that the tetanus bacillus does not belong to the septicæmic class of organisms which spread through the body and by their growth and enormous increase produce their effects, but, on the contrary, remains localized at the original point of infection. While there are a few cases on record in which the bacilli have been found in the tissues of the animal body other than at the point of infection, it does not militate against the fact that in the vast majority of cases the tetanus bacillus remains localized. This will be seen later to have an im-

portant bearing on the treatment of the disease. Nikolaier (17), in many experiments, found tetanus bacilli only twice in the spinal cord and once in the sciatic nerve. Rosenbach (18) found only occasional individual bacilli in two rabbits. Tizzoni and Cattani (19) also obtained positive results in their search for the bacilli. Monastyrski (20) in one out of four cases in human beings found the bacilli. Vaillard and Vincent (21), using a whole brain of a guinea-pig, once obtained a culture of the bacilli. Schnitzler (22) found them in the lymphatic glands in the groin of a patient who died from tetanus following an extensive gangrene from frostbite of the leg and foot. Dor (23) found the bacilli in an effusion of blood in the gray matter of the brain in a patient who died from tetanus from a compound fracture of the skull, and in the cerebro-spinal fluid from this patient. While this case is usually classed as one in which the tetanus bacilli were found away from the point of infection, it certainly would be more conclusive if the primary infection had not probably occurred within the skull. Büdinger's (24) experiments with the lymph nodes of tetanic animals, also cited as proving the presence of bacilli in the nodes distant from the seat of infection, do not sufficiently prove what the author alleges for them. The writer endeavored in two cases of human tetanus to repeat the findings of Schnitzler, but without success. The cultures remained sterile, and the animal experiments absolutely negative.

Nature of the Tetanus Poison.—What is the nature of this poison, and what is the mechanism of its action on the organism?

Richardson (25) in 1859 expressed his belief that the production of tetanus in traumatic cases was due to the fact that the wound in the process of healing secretes a special albuminous product which has the property of a ferment. This substance absorbed into the body excites new chemical changes, and as a product of these there is developed an alkaline or alkaloid substance having properties analogous to strychnine. Of course it was unknown to this observer that this "ferment" was of mi-

crobic origin, but after many years of research this theory has again been brought forward by several observers as the true solution of the character and action of the tetanus poison. These views are strenuously defended by Courmont and Doyon (26) and Uschinsky (27), this last observer having succeeded in obtaining albuminous substances from tetanus cultures grown in non-albuminous media, and considered the substances obtained to be the tetanus poison, more or less pure, and classifies it as a ferment, but the isolation of the pure poison was unsuccessful. As the result of their earlier experiments, Kund, Faber (28), Vaillard and Vincent (29), Tizzoni and Cattani (30), all believed that the tetanus poison was a ferment or enzyme. Fermi and Pernossi (31), in a long series of experiments, seem to have proved conclusively that the poison is not a ferment, and can not be classed with the enzymes. Brieger (32) has worked on another theory, and at first thought the poison a ptomaine, as he succeeded in separating four ptomaines from impure cultures of tetanus; these he named tetanin, tetano-toxine, spasmo-toxine, and the fourth was an unnamed base. But these substances did not on injection give the typical clinical picture of tetanus, though they caused the death of the animals by convulsions, etc. Brieger and Fränkel (33) shortly after this obtained from pure cultures of tetanus a substance which they called the toxalbumin of tetanus, which, on injection into animals, induced the symptoms of tetanic infection.

Recently Brieger and Cohn (34) and Boer (35) have succeeded in isolating the tetanus toxine in seemingly a nearly pure state, and show that the purer the poison the more it lacks the reactions characteristic of the albuminous bodies. Blumenthal's (36) researches seem to confirm the non-albuminous nature of the poison.

What the true composition and constitution of the tetanus poison are, thus remain as yet unknown, but the vigor of its action stands out with terrible distinctness. Brieger and Cohn found that their purified poison was surely fatal to a fifteen-gramme mouse in a dose of 0.00000005 gramme. Reckoning according to the body

weight for a man of seventy kilogrammes or a hundred and seventy-five pounds, it would require but 0.00023 gramme, or 0.23 milligramme, to prove fatal. Comparing it with the snake poisons, Calmette (37) has found that the dried cobra venom requires 0.25 milligramme to kill a rabbit of four-kilogramme weight, and according to body weight it would require 4.375 milligrammes to kill a man of seventy kilogrammes, or a hundred and seventy-five pounds. As the fatal dose of atropine for an adult is a hundred and thirty milligrammes, of strychnine from thirty to a hundred milligrammes, and of anhydrous prussic acid fifty-four (38) milligrammes, the appalling strength of the tetanus poison can readily be appreciated. Without doubt, this poison is the most deadly yet discovered.

The Action of the Tetanus Poison in the Body.—Although the exact mechanism of the action of the tetanus poison on the animal organism is still a subject of controversy, especially concerning some matters of detail, the main points of its action may be considered as fairly proved. After the poison is once formed or injected in the body its absorption is rapid, as the following experiment shows. Roux and Vaillard (39) injected a fatal dose of toxine into the middle part of the tail in several rats; after varying lengths of time the tails were cut off at the base. All animals in which this operation was delayed for forty minutes or more died with the same rapidity as the controls.

The blood usually contains the poison, as has again and again been proved. Nissen (40) first proved that the blood of a tetanic patient was capable of inducing tetanus in animals when injected subcutaneously. Kitasato (41) also found the serous exudates of the pleural and pericardial cavities, as well as the blood, of tetanic animals would cause tetanus when transferred to other animals. Kallmeyer (42), Bruschettini (43), and others have obtained similar results. The blood, after absorption, soon carries the poison over the whole body, the rapidity of the development of the symptoms depending on the amount and virulence of the poison. In experimental

tetanus, and in about one third of the cases in human beings, the first symptoms appear in the muscles adjacent to the point of inoculation or infection. In mild cases, or when a dose too small to be fatal has been received, the tetanic spasm may remain confined to these same muscles. But this peculiar localization of the earliest symptoms can not be explained by the diffusion of the poison through the body by means of the blood, because after absorption the poison must be evenly diffused wherever the blood circulates. Brunner (44) brought forward the theory that the nerve fibres themselves were the direct carriers of some of the poison from the point of entrance, and that the cells in the cord from which the nerves originated were thus the first to receive the poison, and, receiving it in more concentrated doses, first succumbed to its destructive action. Bruschettini's (45) experiments support this view. He found that the part of the spinal cord adjacent to the point of inoculation, either above or below, was always toxic, while other parts were non-toxic. Key and Retzius (46) injected solutions of Richardson's blue in the subdural space with low pressure, and found that the color made its way into the nerve trunk, often through the ganglia, and far out into the nerve branches. When injected into the ganglia or into the nerves the injection mass permeated the perineurium in all directions, and into the endoneurium, and isolated the individual fibres from each other. Injections into the cord showed a spreading of the fluid in all directions, up and down, and transversely. Hence, a fluid can easily go from the periphery to the centre. It is probable that such is the action of the tetanus poison. After the poison reached the central nervous system we had no clew, until lately, as to its further action. There was no appreciable characteristic pathological lesion which could be discovered macroscopically or microscopically. Beck (47), however, has described a peculiar degeneration in the motor cells of the cord in animals killed by tetanus. This degeneration does not seem to attack the entire cells, but only a peripheral part, and seems to be confined chiefly to the body of the cell, usually leaving the nucleus

intact. Only very late do the nucleus and the nucleolus take part in the changes. The changes consist in a swelling of the cell and a homogeneous or finely granular degeneration with a swelling, and finally coarse lumping together of the chromatin. This is especially evident at the tiny eminence from which the axis cylinder arises and in the axis cylinder itself. Beck considers this as proving that the poison travels along the axis cylinder, and that, as the nucleus is the last portion affected, the change is not a necrosis, but only a modification of cell function.

Nissl (48) and Sailer (49) have also found undoubted changes in the ganglion cells in animals, and Nerlich (50) has found, in a case of human "head tetanus," a vacuole formation and progressing degeneration in the cells of the nuclei of the motor portion of the trigeminus, and in the nuclei of the facial and hypoglossal nerves. The experiments of Gumprecht and Brunner prove that the lesion is undoubtedly confined to the central nervous system, the muscles and motor nerves of the inoculated portion of the body having nothing to do with the origin of the tonic spasm nor of the convulsions. The sensory nerves may convey irritant stimuli to the cord, and in this way cause convulsions, but are not otherwise directly the cause of the convulsions. After section of the sensory nerves the convulsions occur in the completely anæsthetic limb.

Goldscheider (51) also believes that the action of the tetanus poison is on the central nerve cells, in consequence of which they assume an increased and ever-increasing excitability, the change taking place gradually, but going on continuously as long as there is absorption of poison from the wound. He maintains that the poison is conveyed to the nerve centres by the nerve trunks, and that it there acts on the ganglion cells gradually, covering a larger and larger area and increasing their excitability. But he believes, in addition, that there is a diffusion of the poison by means of the blood and lymph, to which the general spasms are to be attributed. It seems, therefore, without doubt that the tetanus poison

causes an increased reflex excitability of the motor ganglion cells of the cord and medulla, and is thus analogous in action to strychnine. This theory of the action of the tetanus poison seems to the writer far more probable than the theory of Courmont and Doyon (52). According to these observers the so-called toxine elaborated by the tetanus bacillus is not the true poison, but is a ferment, which forms the poison in the body at the expense of the organism, and is found in the blood, sometimes in the urine, and in especial abundance in tetanized muscles. After this poison is formed it can be extracted from the muscles by boiling, and when injected into other animals causes immediate tetanic symptoms without any period of incubation. The contractures are the results of an irritation of the peripheral sensory nerves, and not due to any direct action on the medullary nerve centres. The characteristic incubation period is the time necessary for the fermentation to take place, and after the minimal fatal dose has been given any larger dose will not shorten the incubation period.

The results of Brieger, Cohn and Boer, and Fermi and Pernossi seem to prove that the poison is not albuminous and is not a ferment. Uschinski and Brunner (53), repeating the experiments of obtaining an immediately tetanizing substance from the muscles, have failed to confirm Courmont and Doyon's results. The incubation period can be as well explained by the dilution of the poison in the blood. From the experiments of Kitasato, and from his own experiments, the writer is convinced that the amount of toxine injected influences the duration of the incubation period. Gumprecht and Brunner have shown that the tetanic spasm and convulsions occur after section of the sensory nerve, and are not dependent on it for a causation of the spasm or convulsions. The injection of blood from tetanic animals causes tetanus in other animals, but always with the characteristic incubation period.

These are the reasons, briefly stated, why Courmont and Doyon's theory does not seem tenable.

All experiments fail to show why in the majority of

cases in human beings, and in some of the higher animals, as the horse and ass, trismus and spasm of the pharynx are the first symptoms, regardless of the point in the body at which the infection has taken place. We must here suppose an elective action of the poison in some animals for the motor cells in the medulla, or, as the poison is slowly formed and acts slowly, an accumulation is necessary, and the muscles in which the inhibitory mechanism is least developed will be the first attacked (54).

When the poison is circulating in the body, do the excretory organs endeavor to discharge it? There is no doubt that this takes place in man and animals, as both the urine (55) and saliva (56) have been found to produce symptoms of tetanus when injected into animals.

Treatment of Tetanus.—The successful treatment of any infectious disease depends largely on our thorough knowledge of its mode of infection, and the mechanism of its action in the body after the infection has taken place. It is for this reason that in this paper the pathological physiology of tetanus has been dealt with in so much detail, for the best treatment of the disease is based upon the logical deductions drawn from our knowledge gained by scientific research.

From the foregoing it is readily seen that the indications for treatment in tetanus are both local and general.

Local Treatment.—First, what are the local indications and how are they best fulfilled? As has been shown, the infection as it occurs in practice can be considered in the majority of cases as an infection with tetanus spores. These spores require favoring circumstances to develop. If we remove these favoring elements we render the germs harmless. Thus, in regions where tetanus is prevalent, thorough cleansing of all wounds, however insignificant, becomes of more than the usual importance. Tetanus may and often does arise from wounds so insignificant that they are healed and forgotten before even the first symptoms of tetanus develop.

For this reason there still remain ideas of idiopathic

and rheumatic tetanus. But these forms of tetanus are nothing more than cases of true traumatic tetanus, in which the point of infection can not be found or is overlooked from its supposed insignificance. A case reported by Sahli (57) well illustrates this point. In a boy suffering from tetanus the only lesions found were some insignificant scabs on the knee and one on the dorsum of the foot. This last was pulled off, and showed underneath healthy granulations nearly healed and no pus. This scab was put in culture and under the skin of a mouse which died of typical tetanus. The cultures showed no tetanus bacilli. The scab, therefore, was simply a source from which fresh toxine might be absorbed. The blood of the child at this time was non-toxic. Not only, therefore, should we carefully attend to slight fresh wounds, but the most strict and careful search should be made in cases in which tetanus has developed for all lesions of the skin, and all scabs should be pulled off and the surface beneath thoroughly treated by the cautery or by some disinfectant.

Disinfection.—Our ordinary disinfectants or antiseptics must here be considered from a different standpoint than is the case in ordinary surgery. Such disinfectants must be used as are not only antiseptic, but also antitoxic—that is, not only destructive to the micro-organisms themselves, but also destructive to their toxic products—for, as we have already seen, the toxines in the tetanic wound are almost as great a source of danger as the tetanus bacilli themselves.

Against our ordinary antiseptics tetanus spores are quite resistant, as five-per-cent. carbolic acid requires fifteen hours' contact to destroy them, and solutions of bichloride of mercury (1 to 1,000) require three hours (58). If, however, a half per cent. of hydrochloric acid is added to either of the above-mentioned solutions the action is greatly accelerated. Five-per-cent. carbolic and a half-per-cent. hydrochloric acid kills them in two hours, and 1 to 1,000 bichloride and a half-per-cent. hydrochloric acid kills them in thirty minutes. If the solution contains 1 to 1,000 bichloride with five-per-cent. carbolic and a

half-per-cent. hydrochloric acid the spores are killed in ten minutes (59). Silver-nitrate solutions destroy the spores in one minute in one-per-cent. solution, and in five minutes in 1-to-1,000 solution (60). Bichloride alone, still further, does not fulfill the requirements in a tetanus wound, as it is absolutely inactive against the tetanus poison (61). The most active antitoxic agents we have are the iodine preparations—*e. g.*, iodine trichloride, Gram's solution, and Lugol's solution. These, besides being antiseptic, destroy the toxine already formed; iodine trichloride, in a half-per-cent. (61) solution, destroying it in less than an hour, and it is with Gram's or with Lugol's solution that the French experimenters weakened their toxine in their first immunity experiments. Kresol, in one-per-cent. (61) solution, is also markedly destructive to the toxine, destroying it within an hour; (61) carbolic acid, one-and-a-half-per-cent. solution, is equally antitoxic, while formalin, one-to-two-per-cent. solutions, exerts a decidedly destructive action in twenty-four hours' contact, as shown by the writer's experiments. Iodoform, chromic acid up to two per cent., and pyrogallol have no effect on the poison, while lysol (62) and potassium manganate, ten-per-cent. solution, require twenty-four to forty-eight hours to be effective. A tetanus wound should not, therefore, be casually cleaned with bichloride or carbolic alone, but should be treated with a stronger mixture, to kill whatever germs are present; but above all should the treatment further consist in a thorough application of the iodine solutions. In sloughing wounds these solutions should be deeply injected in the neighborhood around the wound. When the iodine solutions are not immediately available, and perhaps the hydrochloric acid, carbolic, or bichloride solutions are at hand, rather than rely too much on the hydrochloric acid, which, though antitoxic in a half-per-cent. solution, would be quickly neutralized in the alkaline tissues, it would be advisable to use caustic soda or potash (63) in solutions of 0.3 per cent. or 0.4 per cent., as they are as active as the 0.5 per cent. hydrochloric acid, and would not be subject to the same disadvantage, and would thus act more effectively.

Amputation.—The question of amputation, when the wounds are on the fingers or toes, or when the tetanus follows serious contusions of the limbs, is a question to be carefully weighed and acted upon promptly. It is better for a patient to live minus a finger, toe, or limb than to risk in an acute attack of tetanus the absorption of more poison from a wound whose lacerated and dirty condition prevents a thorough cleansing. In severe wounds of the head and body this question, of course, does not arise, and disinfectants must be relied on to prevent further absorption.

General Treatment.—In the general treatment of tetanus we have, as in all cases of poisoning, three indications to follow: 1. The speedy elimination of the poison. 2. The administration of physiological antidotes to counteract the action of the poison on the body cells. 3. Chemical antidotes which change the poison by destroying it or by rendering it inert, and thus prevent, retard, or arrest its action.

Means to further the Elimination of the Tetanus Poison.—To fulfill the first indication we have but to assist the action of the kidneys and endeavor, by their increased action, to eliminate the poison circulating in the blood. Probably the best means for this purpose is an excessive addition of fluids in the body. There is usually no trouble in persuading tetanic patients, if they can swallow, to drink an abundance of milk or water, as their thirst is usually excessive. Sahli (64) reports that in one of his cases he used with advantage subcutaneous and intravenous injections of salt solution. The intravenous injections seem preferable, as the subcutaneous irritation of the sensory nerves would distinctly tend to increase the convulsive seizures. Diuretin may be recommended to aid the diuresis, as it increases both watery and solid constituents of the urine. Whether the toxines are eliminated by the sweat is unknown; therefore it is hard to say whether an increase in the usual excessive sweating of tetanus would be an advantage. On the grounds that as the urine and sweat vary in inverse ratio to each other, and we are sure of elimination by the kid-

neys, it does not seem that it would be of advantage to increase the already excessive sweating. The toxine is also eliminated by the saliva, but whether this be discharged or swallowed can be disregarded so far as reabsorption is concerned, for in both herbivora and carnivora the living intestinal mucous membrane quickly destroys the tetanus toxines (65).

Physiological Antidotes.—Secondly, in choosing our physiological antidotes we must look for those that will counteract the damage already done by the tetanus poison. We are dealing with an enormously increased reflex excitability of the central nervous system, especially of the motor cells of the cord and medulla. Now, if we are able to hold in check the dreaded tetanic spasms and convulsive seizures of the glottis and respiratory muscles until the organism can recuperate, or if we can prevent the complete exhaustion by the incessant spasms of the cells governing the respiratory and circulatory functions, we may hope for success in our treatment. Fortunately, we possess several excellent remedies which can control this reflex excitability.

The best remedy of all is chloral, while the use of morphine, bromides, physostigmine, and antimony is often indispensable. All narcotics act more or less to diminish the reflex excitability, but chloral is the most reliable and effective. Bromides exert their action more on the cortical centres, and are thus less powerful in a disease like tetanus when the cerebrum is not involved. Physostigmine has been highly praised by many writers for its action in tetanus, seeming especially to control the convulsions. Its action is on the gray matter of the cord, acting first on the posterior horns and then on the anterior. It may in this way diminish the ability of the sensory nerve fibres to conduct external stimuli to the already overexcited motor centres, and thus diminish the reflex convulsions. Later, its paralyzing effect on the anterior horns would in itself prevent the spasms. Antimony was suggested to the writer as a remedy in tetanus by Dr. W. R. Bross, of New York city, who used it in Costa Rica in five cases of acute tetanus with short incubation periods,

and succeeded in saving all five patients. He recommends that it be given in an eighth to a sixth of a grain doses with an equal amount of morphine every two hours. When given in this way it does not cause vomiting, and certainly seems to control the spasms, as was evident in a case of tetanus recently under the writer's care. According to Nothnagel and Rossbach (66), antimony causes complete disappearance of reflex activity, which on physiological grounds places it among the desirable remedies.

Morphine has an especially advantageous action of its own. Only in large doses is it usually considered to diminish the reflex excitability of warm-blooded animals; still it causes a cessation of the pain and produces sleep. As the tonic spasm in tetanus relaxes during sleep, morphine indirectly secures the end in view. Sleep in itself to the exhausted patient is a necessity, so that morphine fulfills two indispensable indications. The bromides are also useful in this connection, as they tend to diminish the overwrought condition of the brain and aid in producing sleep. The anæsthetics are not to be recommended for more than short periods, and their repetition is not without danger. Sahli (67) rightly emphasizes two factors in dosage: one is the individual factor in each case, the other the changing and alternating the remedies, for the purpose of preventing a tolerance to the drugs. As this author points out, if from the beginning one should reckon in a given case of tetanus the dose of the narcotics to be administered for several days, one is apt to give either too much or too little, since it is quite impossible to estimate the sensitiveness of the patient, as it is so greatly modified by the disease itself. Even in a single day the doses may have to be modified. It is wisest to begin with doses which in a healthy individual would produce a decided effect—*e. g.*, thirty grains of chloral hydrate, forty-five grains of bromide of sodium or potassium, and a sixth of a grain of morphine. The convulsions are the best criterion for judging whether narcotics should be increased or diminished. The toxic spasm is not so dangerous as the sudden convulsive seizures, and usually begins to relax simultaneously with the cessation in frequency of

the convulsions, when improvement begins. As Sahli expresses it: "In the choice of the remedy the principle of alternation is the chief factor. If one always gives the same preparations, or always all the remedies in combination, one will generally have the experience that the effect is soon lost by tolerance. It is in one's power to prevent this by alternating the remedies. Of course, in giving the remedies of the chloral group a careful supervision of the pulse is necessary, while with bromides and morphine this effect is much less to be feared."

Chemical Antidotes.—Thirdly, have we any true chemical antidotes which circulating in the blood are able to destroy or render inert the tetanus poison? The substances which Kitasato, and later Fermi and Pernossi, have shown to be antitoxic are, as a rule, not available for therapeutic purposes. The most effective antitoxic substances, as we have seen, are carbolic acid, kresol, and the iodine solutions. While these substances are so effective outside the body, is it possible to obtain a sufficient concentration within the body to destroy the toxine? Our experience with internal antiseptics in general infections does not give us much hope in this direction. Too great a concentration of the antidote is necessary for us to hope for any effect on the tetanus poison. Bacelli (68), it is true, recommends subcutaneous injections of one-per-cent. solutions of carbolic acid, and several cures are reported following this plan of treatment. Though this was recommended empirically at first, carbolic acid is antitoxic and it may perhaps have some action; but as a half-per-cent. carbolic acid is used to preserve the toxine in the laboratories, it is more than doubtful if sufficient concentration could be obtained in the blood to make it effective, and besides, its poisonous effect on the organism is certainly to be feared.

Antitoxine.—We have therefore to turn to antitoxic serum, which, as we know by absolute proof, in some way renders inert the toxine circulating in the blood.

Preparation of the Antitoxic Serum.—The tetanus antitoxine is prepared in the same manner as the diphtheria antitoxine, by inoculating the tetanus toxine in in-

creasing doses into horses. The toxine is grown in bouillon under hydrogen, and after ten or fifteen days filtered through porcelain, and the germ-free filtrate is used for the inoculations. The horses receive half a cubic centimetre as the initial dose of toxine, and this dose is increased as rapidly as the horses can stand it, until they support seven to eight hundred cubic centimetres or more at a single dose. After some months of this treatment the blood of the horse contains the antitoxine in sufficient amount for therapeutic use. When the animals' temperatures are normal and they have recovered from the dose of toxine last given, they are bled into sterile flasks and the serum collected. The serum contains the antitoxine and is tested on white mice or guinea-pigs.

The Antitoxic Serum of the New York Health Department.—The New York health department has at present two horses well immunized against tetanus, and furnishes serum of the strength of one to four hundred million —that is, one cubic centimetre will protect four hundred million grammes of white mice against a three-to-four-day fatal dose of tetanus toxine. Reckoning in antitoxic units, twenty cubic centimetres of serum will contain eight thousand antitoxine units, an antitoxine unit in tetanus being the amount of serum necessary to protect one million grammes of test animal.

The serum is supplied in twenty-cubic-centimetre bottles, and should be injected in ten-to-twenty-cubic-centimetre doses. In severe cases the patient should receive fifty cubic centimetres in the first twenty-four or thirty-six hours, and these ten-to-twenty-cubic-centimetre doses repeated once or twice each day during the following four or five days or longer, according to the course of the disease. The circular accompanying the bottles explains more fully the proper method of procedure.

The Action of the Antitoxic Serum in the Body.—As has been shown by Roux (69) and Calmette (70), the antitoxic serum has no direct destructive action on the toxine itself, but through some unknown action on the body cells the serum prevents the toxine from exerting its destructive action. Behring's first idea that there was

a direct destructive action between the antitoxine and toxine or some neutralizing effect, such as occurs between an acid and an alkali, has been shown to be incorrect. As Buchner (71) also shows, there is no destructive action of the antitoxic serum on the toxine either outside or within the body, the action seeming to be one which, by producing certain changes within the cells, renders the action of the toxine inert. Tizzoni (72) concludes that the blood serum of vaccinated animals does not act as a remedy which neutralizes in the organism a certain active principle of disease and directly counteracts certain functional changes [as our physiological antidotes do], but it acts, in all probability, in curing tetanus by immunizing the parts of the body not already tetanized, and so limits the tetanus to a local form.

Comparison of Statistics.—In estimating the value of any new remedy we must have certain undeniable facts on which to base our comparisons of old and new, such as a known death-rate, and we must criticise minutely our statistics rather than simply compare the death-rate. Unfortunately, the death-rate in tetanus has been so variously stated by different authors that it is difficult to say what is the true average mortality. In acute cases it is given as being from seventy-eight to 96.6 per cent.; in chronic cases, as being from 17.8 to fifty-five per cent.; the average for all cases varying from twenty-one to 87.5 per cent. The largest number of cases collected are 1,222 (73) war cases, with a mortality of 88.6 per cent., and 280 (74) cases occurring in time of peace, with seventy-six per cent. mortality, making 1,502 cases, with 87.7 per cent. mortality.

The fairest estimate seems to be eighty per cent. for acute cases, and about forty per cent. for the milder or chronic cases, and sixty per cent. mortality for all cases. In estimating the value of the antitoxine treatment we must consider in each case the duration of the incubation period of the disease (75), the rapidity of the onset, with the frequency and intensity of the convulsions, and finally the promptness with which any kind of rational or radical treatment can be or has been ap-

plied. The prognosis in cases not treated with antitoxine is relatively favorable if the incubation period is long, ten days or more, the onset slow, and the spasms are not severe; it is bad if the incubation period is less than ten days, the onset rapid, and the spasms severe (76). The following cases of tetanus comprise published and unpublished cases treated with antitoxine.

Résumé of Cases Treated with Antitoxine.—We have a total of a hundred and fourteen cases with a mortality of forty-six, or 40.35 per cent. All those with an incubation period of eight days or less and with a rapid onset of the symptoms, or those with a longer period of incubation, but with an intensely rapid onset, have been classed as acute cases. All those with incubation period of nine days or more, or those with a shorter incubation where the onset was slow, have been classed as chronic. Six cases from lack of sufficient data are not classed; five of these patients recovered, one died with a complication of pneumonia. There remain forty-seven acute cases, with twelve recoveries, thirty-five deaths, and a mortality of 74.46 per cent. Of the chronic type, sixty-one cases, fifty-one cures, and ten deaths—a mortality of 16.39 per cent. Following Kanthack's system of criticism, we must exclude all cases which have died with intercurrent diseases, and all cases of those who died twenty-four hours after treatment was begun, as these really prove nothing as far as a fair estimate of any treatment is concerned; but we must also exclude all mild cases of recovery which did not receive treatment till the tenth to fifteenth days of disease, as such cases usually get well under any treatment. We must therefore exclude sixteen deaths in the acute cases, leaving thirty-one cases, with twelve recoveries and nineteen deaths—*i. e.*, 61.29 per cent. mortality. We must also exclude in the chronic cases thirteen cures and eight deaths, leaving forty cases, with thirty-eight recoveries and two deaths, or five per cent. mortality. This is certainly an improvement on the usual death-rate, being a total mortality of only 29.57 per cent. Of course, a final judgment of any treatment must be based on a larger total than seventy-one cases. But such a num-

ber is sufficient to show that some new beneficial factor has been present in the new treatment which was absent in the old methods. Yandell, in 1870 (77), in speaking of the prognosis of tetanus, declared that "recoveries from traumatic tetanus have been usually in cases in which the disease occurred subsequent to nine days after the injury. When the symptoms last fourteen days recovery is the rule, apparently independent of treatment. The true test of a remedy is its influence on the history of the disease. Does it cure cases in which the disease has set in previous to nine days? Does it fail in cases whose duration exceeds fourteen days? No agent tried by these tests has yet established its claim as a true remedy for tetanus." Does antitoxine by these criteria establish a claim as a true remedy for tetanus? In acute cases, developing eight days or less after the injury, in thirty-one cases the recoveries have amounted to 38.71 per cent., deaths 61.29 per cent., as against treatment without it of twenty per cent. of recoveries and eighty per cent. of deaths. In one hundred and one cases in which the duration of the disease is given, all those which passed the fourteenth day recovered. Antitoxine, therefore, by Yandell's criteria, fairly establishes itself as a true remedy for tetanus.

There are some cases of tetanus of such short incubation and such intense rapidity of onset that in spite of all treatment they die within from twenty-four to thirty-six hours after the first symptoms appear. These cases at present seem hopeless.

Limitations of the Treatment with Antitoxic Serum.—From the nature of the antitoxic serum and its peculiar action in the body it is necessarily limited in its action. We have shown that it does not directly act on the tetanus poison and destroy it, and that it can not undo the injury already done; it can only prevent further damage. It is possible, as certain cases of Roux's (78) show, that the disease may go on to a fatal termination, even after the blood of the patient has become markedly antitoxic. This emphasizes very strongly the necessity of the early use of the antitoxine; besides, as Behring (79) has shown,

the amount of serum necessary to protect an animal, when introduced simultaneously with the toxine, must be increased a thousand times if we wait till the first symptoms appear, and ten or a hundred thousand times if we delay a few hours longer. The serum will render inert the toxine circulating in the blood and any more toxine which may be generated in the wound; it is therefore necessary to inject the serum as soon as possible, and in sufficient abundance. Compared with the results of serum in diphtheria, the results in tetanus must always fall far short in their success. In diphtheria the position and character of the lesion give early warning before the body is hopelessly poisoned, but the tetanus poison has insidiously gained control and often irreparably damaged the organism before its symptoms show themselves. The rapidity of recovery in the cases treated with antitoxine does not seem to depend on the amount of antitoxine injected nor as much as one would expect on the day of injection. This seems in direct opposition to what has just been said above, but is the logical consequence of the mechanism of the action of both toxine and antitoxine. Recovery depends entirely upon the degree of damage which the toxine has done before the antitoxine has been injected. As the virulence and the amount of poison and the extent of damage already existing in any given case are always unknown, and must remain unknowable, it is but another warning, stronger than anything else can be, that we must use the antitoxine at the earliest possible moment.

The general treatment of a tetanus patient, such as nourishment and absolute quiet and rest, stuffing the ears with cotton to keep out sounds, etc., has not been touched upon, as it is self-evident.

Preventive Inoculations.—By means of the antitoxine treatment, combined with other rational methods, the prognosis, even in acute cases, has been improved; but it still remains exceedingly grave, so much so that the preventive inoculation of serum in all cases where dirt has been ground into serious contusions deserves a much more extensive consideration than has yet been given it.

In France, Dr. Bazy (80), after having four fatal cases of tetanus in one year, has made it a practice to inject ten cubic centimetres of serum into all patients who have come under his care with wounds which caused him to fear a possibility of tetanus. He has not seen a single case of tetanus since, though his practice has been in a region where the soil is notoriously contaminated with tetanus bacilli. Nocard (81), in veterinary practice, first followed this plan of treatment, and reports that of three hundred and seventy-five animals treated with immunizing doses of serum not a single animal has acquired tetanus, while in the same locality he has seen fifty-five cases of tetanus in animals not so treated. These are certainly striking results, and it seems wise in a neighborhood like New York, where tetanus is not uncommon, to treat patients with immunizing doses of serum when the lacerated and dirty condition of their wounds may indicate the possibility of a tetanus infection. They will not have tetanus, and we may never know whether they otherwise might have had the disease, but we certainly shall prevent the patient from running the risk of an acute attack of tetanus, which is the main point.

An attempt has been made in this paper to explain the pathological physiology of tetanus, and to build on established scientific data the rational line of treatment which promises the greatest success. There is no line of treatment which will give as brilliant results as one would wish for, but, as Roux has said, one can not choose in practice either the case or the time of intervention. We must, therefore, use that which gives us most promise—local disinfection, physiological antidotes to hold the disturbed functions of the cord in check, and the antitoxic serum to annul all further action by the toxine. By these means the recovery of the patient seems best assured.

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Dr. W. H. Park said that he had had an unpleasantly large experience with tetanus in the lower animals. During the past hot summer the workers in the laboratory had become aware that a large number of tetanus germs were present. This had probably been due to the fact that the laboratory was near a stable. Before this had become known they had been surprised with the occurrence of tetanus in a number of the animals. He was disposed to take issue with the reader of the paper regarding the rapidity of absorption of the tetanus toxine. Tetanus and diphtheria were very much alike, and it had been established that the poison of diphtheria was very slowly absorbed. In cases of tetanus it was well known that there were no tetanus bacilli alive in the wound at the time of the development of the symptoms of the disease, but certainly the toxines were present in the tissues. In one of the goats that had first become affected with tetanus at the laboratory, a portion of tissue from the wound had been examined, and had been found to be free from tetanus bacilli, yet the tissue when inoculated into animals had produced tetanus. As it was thought that the tetanus was due to the fact that the animals were kept in the stable, most of the animals had been immunized with the tetanus antitoxine. All the animals so immunized had failed to develop tetanus, while the animals not so immunized had developed tetanus.

Dr. Gouley spoke in terms of high commendation of the paper just presented. He cited one case in illustration of the early use of what appeared to be the most powerful agent in the treatment of this very serious disease. He said that the winter before last a patient, a baker who had accidentally shot himself in the finger, had been brought to Bellevue Hospital on the fifth day. No one had suspected tetanus up to that time, but the

symptoms had been well marked, and he had given a bad prognosis. Nevertheless it had seemed to him to be proper to give the tetanus antitoxine a trial. It had been given, but too late, the man dying a few hours afterward. Many years ago he had had occasion to observe for several weeks two cases of tetanus treated in the old-fashioned way by the free use of morphine and iodide and bromide of potassium. In both of these cases the symptoms of tetanus had not been observed for two weeks after the injury. Both had made a good recovery, but convalescence had been very slow, the trismus remaining at least two months.

Dr. LAMBERT said that he could not agree with Dr. Park that tetanus and diphtheria poison acted similarly. The diphtheria poison produced œdema; the poison of tetanus produced no local symptoms whatever, except in man and animals paralysis of the facial nerve, and the reason for this was not yet definitely known. As it differed in local action, it was quite probable that it differed also in its absorption. Of the hundred cases in which the duration of the trismus was given, it had varied from fourteen days to nearly two months. In the cases he had seen, the last muscles to regain the natural state had been the belly muscles.

Meeting of May 5, 1897.

The President, Dr. LUCIUS W. HOTCHKISS, in the Chair.

Excision of the Second Division of the Fifth Nerve for Neuralgia.—Dr. FREDERICK WALKER GWYER presented a woman, sixty-six years of age, a native of Germany, who had been admitted to his service at Bellevue Hospital on November 17, 1896, with the following history: Fourteen years ago menstruation had ceased suddenly, and almost immediately thereafter she had experienced lancinating pains in the left side of the face. She had consulted several physicians, and had been under treatment for a number of years, the neuralgic pains not only continuing, but becoming more frequent, longer in duration, and more severe.

In 1891 an operation had been performed by Dr. McBurney. It had consisted in raising a flap opposite the spheno-maxillary fossa, dividing and reflecting the

zygomatic process of the temporal bone, and allowing approach to the second division of the fifth nerve in the fossa between the pterygoid process of the sphenoid and the superior maxilla. The nerve had then been isolated, hooked up, and a considerable piece removed. The patient had left the hospital quite free from pain, and had continued so for a year after operation, when it had recurred. At about this time the patient had begun to use morphine to alleviate the pain, increasing the dose until, on her admission, she was taking about ten grains a day. From the beginning of 1893 till she had come under his care she had been under treatment—strychnine in increasing doses for several months; electricity for a long time, etc.—but the attacks of pain had increased in frequency and severity. On admission the pain had been almost continuous, and the slightest nervous excitement had been sufficient to excite a paroxysm.

Careful examination had limited the pain to the second branch of the fifth nerve, and on December 16, 1896 he had operated. As a preliminary step, the infraorbital nerve had been sought for at its exit on the face, and a ligature placed about it. An incision had then been made over the upper border of the zygoma and parallel with it, and from the anterior end of this incision another, at right angles to it, had been carried downward and forward for a distance of an inch and a quarter. The zygoma had been sawn through at its anterior and posterior ends and reflected downward with the skin flap. By drawing the temporal muscle backward and keeping close to the posterior surface of the superior maxilla, the bottom of the spheno-maxillary fossa had been reached, the spheno-maxillary fissure recognized, and the nerve laid bare and verified by a pull on the ligature about the infraorbital nerve. Traction on the nerve in the fossa had drawn it slightly from the foramen rotundum, and there it had been divided. The ligature had been removed from the infraorbital nerve, and that nerve divided, and traction on the cut end of the nerve in the spheno-maxillary fossa had brought it and its branches out. The next step in the operation, so far as he knew, was novel. Realizing the thoroughness of Dr. McBurney's operation, and the proneness to reunion of divided nerves, even when long pieces had been removed, he had filled the orifice and neighborhood of the foramen rotundum with a plug of dental composition which was antiseptic and malleable after immersion in hot water. In this case it had been

softened in hot bichloride solution, so that the surface might be thoroughly clean. The zygoma had then been replaced and held by two catgut sutures passed through the periosteum, and the external wounds closed with silk, the dressing being iodoform collodion and gauze. Primary union had resulted.

About a month after the operation it had been noticed that the lower eyelid was very œdematous. This had been thought to be due to interference with the circulation, through adhesion of the cicatrix of the wound through which the infraorbital nerve had been reached. The cicatrix had been cut out and, following the healing of the wound, massage had been used with fair success. Accompanying the œdema there had been interference with the facial nerve function, noticeably paralysis of the orbicularis palpebrarum muscle. This was just regaining its action. On January 27, 1897, the patient had been discharged from the hospital, having had no pain since the operation. She had been kept under observation, however.

The selection of the extracranial, rather than the intracranial, operation he thought was justified in view of the large mortality accompanying the latter, the age of the patient, and the seeming limitation of the trouble to the second branch, and the success, even if temporary, in freeing the patient from pain, of the operation done. The Braun-Lossen operation was preferred to the Lucke, because of less disturbance to the muscle attachments and because it could be done with the same facility. Although the field of operation had been small for the great depth at which the nerve lay, an electric headlight had given the requisite illumination, and the work had progressed without hindrance.

It was to be noted that the divided tissues showed at no point marks of a former operation, and the nerve removed had appeared macroscopically to be normal in appearance, thickness, and consistence, and had, no doubt, regenerated completely. Whether it would again unite or not, in spite of the obstacle placed in its path, time only would tell. In another operation he would prefer a vertical incision over the supraorbital instead of a horizontal one, as with such incision there would be less disturbance to the circulation and nerve supply.

The patient had been free from neuralgic pain since the operation, but had lately had sensitiveness under the eye and about the upper and lower lip. As it was still too early for regeneration to be expected, the in-

creased sensibility was probably due to attempts at nerve anastomosis or vicarious function, which might be traced to the facial. The amount of morphine taken had been reduced voluntarily from ten grains to one grain daily. A couple of years must pass before it could be decided whether or not the great length of nerve removed and the plug of dental composition would prevent reunion.

Cyst of the Thyreoid.—Dr. PARKER SYMS presented a specimen of cyst of the thyreoid gland which he had removed by enucleation. The patient, a man of sixty years, had had good health, and had given a good family history. There had been no evidences of myxœdema; no disturbance of the heart's action—in fact, no symptoms except the dyspnœa produced by the pressure of the tumor on the trachea and larynx. His voice had been but little altered. He had first noticed this swelling twenty years ago. It had steadily enlarged, and, of late, had greatly interfered with his respiration. The operation had been done on March 23, 1897, and the patient had made a comfortable and uninterrupted recovery. As the patient was a stout man, with an unusually short neck, the removal had been more difficult than it otherwise would have been. An incision, five inches in length, had been made in the median line, extending upward from the suprasternal notch. From the upper end of this incision a second one, about three inches in length, had been made, at a right angle to the first incision. These incisions had extended through all the overlying structures. An incision had then been made through the gland tissue, exposing the true cyst wall, and the cyst had been enucleated without removing any glandular tissues. There had been but little hæmorrhage, and that only venous, and easily controlled. The transverse incision and the upper part of the median incision had been sutured, and the former site of the tumor packed. The specimen presented was a large, oblong cyst with a thin wall. It measured five inches and a half in its long diameter, and three inches and a half in its short diameter.

Case of Tuberculous Arthritis of the Hip and Elbow Joints; Excision of Hip and Elbow Joints.—The PRESIDENT presented a patient, a boy about eight years of age, in whom he had performed an excision of the left hip and the right elbow joint for extensive tuberculous osteomyelitis, apparently a sequela of scarlatina.

His history was as follows: Frank C., aged seven

years, had been admitted to J. Hood Wright Memorial Hospital on February 4, 1896.

His family history was good. He had generally been a healthy child. Two years ago he had had an attack of chorea, from which he had recovered and had remained well until about four months and a half before admission. At this time he had had an attack of scarlet fever. While convalescent from this he had been taken with pain and swelling of the right elbow joint, and pain in the left knee joint. This had been thought to be an attack of rheumatism.

The pain in the knee had continued after the supposed attack of rheumatism had left him, and this had been followed by the development of pain in the left hip. The hip, his father said, had become so painful on motion that the child had been obliged to remain in bed. During this time he had lost much flesh. About two months ago a swelling on the left thigh had been incised by the physician in attendance, and a good deal of pus and a few pieces of dead bone had been removed. The resulting sinuses had discharged pus freely ever since.

On admission, the body and lower extremities had been considerably emaciated, but the face had been full and like that of a well-nourished child. He had lain upon his back with the left thigh quite strongly flexed, adducted, and rotated inward. There had been apparent shortening.

There had been a sinus on the outer and one on the inner aspect of the thigh, below the hip. Both sinuses had been discharging pus. Dead bone could be felt with the probe.

The right elbow joint had been swollen and tender. The swelling had been spindle-shaped and had felt doughy. There had been tenderness and thickening for quite a distance up from the lower end of the humerus—evidently an extensive tuberculous osteomyelitis of the bones entering into the formation of the right elbow joint. The motion had been much restricted. There had been a range of possibly forty-five degrees. The position of the joint had been very nearly that of right-angled flexion. The pulse had been somewhat rapid; the temperature 99.2° F., and the respirations 26. Urine had been clear, 1.020; no albumin present.

On February 8th, under ether anæsthesia, the posterior incision had been made, the joint opened, and

the neck of the femur had been found nearly destroyed, so that it had come away from the shaft like a bone sequestrum. The head of the bone had been freed and removed, and the acetabulum well curetted. The old sinuses had been curetted thoroughly, and the operation wound partially sutured, but mainly packed with iodoform gauze. A plaster-of-Paris splint had been applied over all, with the limb held in corrected position. The patient had recovered well from the ether, and the wounds had granulated rapidly. By February 22d the discharge from the operation wound had been very slight, and the patient's general condition had improved very much. There had been no pain in hip or knee. He had been allowed up on crutches, the plaster splint, of course, being retained.

In March, the boggy areas about the right elbow having become softened, they had been incised, considerable tuberculous pus had been evacuated, and the abscess cavities had then been distended with sterilized iodoform oil, ten per cent.

The patient had been discharged on March 13th, having gained remarkably in flesh, strength, and color. Dr. Hubbard had fitted him with a traction brace for the excised hip, and with this he got about well. There was still a sinus, the granulations in which looked tuberculous.

On April 23d the patient had been readmitted for operation on the right elbow joint, which had appeared extensively diseased. The range of motion had been now limited to about thirty degrees, and the joint had been quite painful at times, so that the patient had held it as quiet as possible. The plaster fixation and the iodoform-oil injections having been ineffectual, excision of the diseased bones had seemed the only alternative. On April 25th, under ether anæsthesia, the usual posterior incision had been made, and the joint excised in the usual manner. The lower end of the humerus had been so extensively diseased that nearly an inch of bone had been sawn off, and the medullary cavity of the shaft curetted carefully. The tissues all about the joint, the fasciæ, muscles, etc., had been extensively infiltrated with tubercular material and had all been cut away, as far as could be seen, with scissors. The whole of the somewhat extensive wound surface had been rubbed with iodoform and the wound sutured except at the centre, where it had been left open for iodoform-gauze packing. The arm had been put up in a position of nearly right-angled flexion in a felt angular splint.

On May 5th the patient had been discharged, the wound being in a satisfactory condition, and he had been instructed to return for dressings. The result of this operation, after a year's time, was now evident. The wound had entirely healed; there were no sinuses; there was fairly firm ankylosis at the joint, which, considering the extensive disease of the bones at the time of operation, was the most fortunate result, because, with a movable joint in this case after such extensive excision, one might expect a flail joint.

The patient had returned to the hospital in August with another abscess on the inner side of the thigh. This had been opened and curetted by Dr. Le Boutillier, who at the same time had explored the sinus over the outer aspect of the hip, and had found and removed some diseased bone. The patient had been discharged on August 30th, when the sinus had been reported to be granulating slowly.

Since that time he had had various abscesses form in the subcutaneous tissues of the body. These had generally been painless and, on being opened, had allowed the escape of flaky pus, characteristic of tuberculous abscesses. At present, there was one cold abscess over the chest wall, which was not especially tender, and over which the skin was not reddened. There was another near the top of the coccyx. In spite of the extensive infection of the connective tissues, both the bony and the subcutaneous, this little patient had enjoyed good health and looked rosy and well. He still wore his hip brace. There was still a small sinus over the hip joint, but his condition was so good that he went to school, and enjoyed himself with the other boys playing out of doors.

The case seemed one of considerable interest, as an example of tuberculous osteomyelitis occurring after scarlet fever, and as an example of recovery from very extensive bone lesions without, as yet, any apparent involvement of lungs or internal organs.

A Case of Tuberculous Arthritis of Hip in an Adult of Thirty-five; Excision of the Hip Joint.—The PRESIDENT presented a second case, one of tuberculous arthritis of the hip, in a man of thirty-five years, in which he had successfully performed excision. The history of the case was briefly as follows: Previous history negative.

About seven months ago he had begun to have pain in the left hip and knee, and had begun to limp. The pain and restricted motion had become worse until about six weeks ago the patient had become helpless and un-

able to walk. He had noticed a swelling in the groin for at least two months previously, and this swelling had gradually increased in size until, at the time of admission to the hospital, January 29, 1896, it had formed a large fluctuating tumor occupying nearly the whole of the upper, middle, and inner part of the thigh. His chief complaint had been pain in the hip and knee.

An examination of the lungs had been negative. The heart had been normal, and the urine had contained neither albumin nor sugar. Examination of the right hip had shown motion very much restricted and painful; great muscular spasm present on attempts at movement; thigh flexed and rotated inward; knee also flexed. There had been a large fluctuating tumor on the inner aspect of the thigh. Temperature, 102°; pulse, 96; respiration, 36.

The condition of the patient had seemed bad, and, though the diagnosis of tuberculous osteomyelitis of hip had been made, it had not been regarded as wise to do more at first than incise the large abscess of the thigh and see how the patient reacted. Accordingly, the patient had been etherized the next day, January 30th, and the abscess freely incised, flushed, and drained. Large quantities of pus had been evacuated. The condition of the patient had improved at once, and he had begun to put on flesh and increase in strength daily. The pain in the hip had continued, however, and the small sinus had remained.

On March 10, 1896, under ether, excision of the right hip joint had been performed, the posterior incision being used, and the head and neck of the bone cut away with a chisel. The cavity of the joint had contained pus, and the head and neck of bone had been diseased. The head, being very firmly adherent, had been removed piecemeal by chiseling. The acetabulum had also been chiseled. The cavity had been packed with iodoform gauze, and the limb, being held in extension, had been put up in a plaster-of-Paris splint. The wound had granulated finely, and the patient's condition had improved. A sinus had, however, persisted, and dead bone could be felt. Accordingly, in May, Dr. Le Boutillier, who had succeeded the speaker on the service, had cut down upon the bone, removed some fragments, and chiseled out the acetabular cavity. The patient had been discharged from hospital on June 30th, with a very small sinus, but in fine condition, and able to get around on a crutch well. The sinus had soon healed

completely. The patient at present showed a cicatrix over his right hip, but no sinuses. There was a good range of motion at hip, so that he could put his foot up in a chair. The shortening, which had not been very great, had been overcome by the high shoe on the affected side. He used a crutch and cane in the street, but got about the house well without them. He was perfectly well and strong, and had no evidences of tuberculous lesions in lungs or elsewhere.

The result certainly had been a good one, and the case was interesting as illustrating the occasional occurrence of a tuberculous hip-joint disease in an adult of thirty-five without apparently other bone or visceral infection, and it showed also a very good result following a successful resection of the joint.

The speaker said that he was convinced that a fatal result would have occurred had he attempted to remove the diseased bone at the first operation, and he thought that, in cases with large abscesses, especially where the patient's general condition was depressed, an operation first to open the abscesses, and a later one on the joint, was the safer method, and the one more productive of good results all around.

Dr. WALTER C. WOOD said that the cases presented by the president showed the advisability of operating for tuberculosis with marked sepsis at more than one stage, and also the wisdom of not doing too much at one time.

The PRESIDENT said that he was positive that the man with tuberculosis of the hip would have succumbed had the larger operation been done at the first.

Paper.

ON SEVERAL CASES OF APPENDICITIS.

BY A. BROTHERS, B. S., M. D.

WITHIN a few weeks of each other I recently met with several cases of appendicitis so different in character that I trust you will pardon me for describing them in brief. The subject of appendicitis is one of fascinating interest, and, although very much has already been written, there is still a feeling of uncertainty as to the exact limitations of the medical or surgical management of this disease. Any contribution which

tends in the slightest degree to more sharply define these boundary lines must be of value.

Case I.—Mrs. D., aged thirty years, called at my office on March 15, 1897. According to the history she was married at seventeen, gave birth to one child, and separated from her husband four years later. Since that time she has worked out for a livelihood. Three years ago she was operated on at Bellevue Hospital for some uterine trouble. Several weeks prior to her visit to my office she complained of uncomfortable sensations about the abdomen, principally on the right side. At no time were these pains sufficiently intense to force her to bed. She was simply incapacitated from attending to the heavy work of a servant.

I made a careful examination, excluded annexal disease, and located distinct tenderness over McBurney's point. I sent her to Beth Israel Hospital to try the effect of rest in bed and medical measures—such as the continuous use of an ice-bag, liquid diet, and mild purgation. After a week's observation, with the patient perfectly quiet in bed, there was no change. Although there was at no time any appreciable elevation of temperature or any evidence of tumor, the localized tenderness over the appendix persisted. She was advised to go home in the hope that this tenderness would gradually wear away, but was warned to immediately report in case of any exacerbation of the pain. On leaving the bed she complained that her pain was as bad as ever and, as she had to work for a living, she implored me to operate at once. To this I finally consented.

On March 23, 1897, under ether, I made the usual incision. On opening the peritoneal cavity I found it impossible with the sense of touch to locate the appendix. On exposing the cæcum and following downward the striated fibres, I discovered the ulcerated stump of the appendix, about three quarters of an inch in length, and buried in adhesions. With fine silk it was ligated close to the cæcum and removed. The wound was closed without drainage—the peritonæum, fascia, and integument being sewed up separately. There was absolutely no reaction, and the wound healed by primary union. On the eighth day the patient was sitting up in bed, and on the fourteenth day she left the hospital cured.

Case II.—Abraham R., aged sixteen years. At the City College on March 30, 1897, he was taken sick with a sudden attack of abdominal cramps. During this day

and the next he was treated for colic by a medical student and his mother. He was given calomel and castor oil. As his condition seemed to grow steadily worse, I was sent for on April 1st and found him suffering from an acute attack of appendicitis, with tenderness well defined over McBurney's point. During the third and fourth days of the disease the temperature (axillary) ranged between 99° and 102° F., with a pulse of 100 to 120. Pain continued localized without any evidence of a tumor. Expectant treatment was followed—chiefly the continuous application of an ice-bag to the appendicular region, horizontal decubitus, and an occasional small dose of morphine. On the fifth day—without any change in temperature or pulse—I noticed a beginning tumefaction of the abdomen, and with this a tendency of the hitherto localized tenderness to spread itself across the median line to the opposite side. In spite of the unchanged condition in the patient's pulse and temperature, in spite of the persistence of the local pain, in spite of a complete absence of symptoms indicating shock, I advised an immediate operation, and solely for the one reason that there was present beginning tympanites, with a tendency toward extension of the hitherto localized tenderness. A consultation was requested, and within several hours my friend Dr. H. M. Silver responded. He coincided with me in the necessity for prompt surgical intervention, and kindly supervised the operation an hour later at Beth Israel Hospital.

On making the usual incision, the gangrenous appendix—rigid, and about two inches in length by half an inch in diameter—was, after a little search, found floating in thin pus at the lower angle of the wound. Excepting a few recent adhesions to the right, there was a free communication with the general peritoneal cavity in all other directions. After mopping up the pus—probably not more than an ounce—and temporarily isolating the appendicular region from the general peritoneal cavity by means of strips of iodoformized gauze, the appendix was amputated. On inspecting the stump it was found possible to strip it a little farther backward and remove the remaining portion just at its origin from the cæcum. This explains why the specimen presented to-night consists of two portions. The appendix stump and the adjacent area whence the pus had come were touched with peroxide of hydrogen. The gauze strips were removed and re-

placed by fresh ones introduced above, below, and to the left between the folds of intestine. A central strip was passed directly down to the stump of the appendix. By the use of appropriate medication the bowels were made to move after twenty-four hours. After thirty-six hours the dressing was changed. At no time after the operation did the temperature exceed 100° F. or the pulse count above 90. After the second week the boy was out of bed, and at the end of the third week the granulations were continuous with the surrounding surface of integument.

Case III.—Mrs. Taube G., aged twenty-eight years; washerwoman. Menstruation began at the age of thirteen and was always regular. For the past two years it has been associated with pain. She was married at sixteen years, gave birth to three children, and has been a widow for five years. She entered Beth Israel Hospital on April 8, 1897, to be treated for pain in the right iliac region, which for some time previously had incapacitated her from earning her livelihood. On examination the uterus was found to be normal. The left annexa were readily felt and presented nothing abnormal. On the right side the appendages could not be located by bimanual examination on account of the abdominal rigidity excited by pressure. The painful area, however, was not in the pelvis but higher up, and located directly over the region of the appendix—over McBurney's point. After several days' observation, during which there was no elevation of temperature or any change in the local conditions, it was decided to perform an exploratory laparotomy.

On April 16, 1897, an incision about two inches in length was made in the right inguinal region above and parallel with Poupart's ligament. On opening the peritoneal cavity the finger introduced into the wound over the site of the appendix discovered a cystic ovary—globular, tense, and about an inch and a half in diameter. The adhesions, if any, must have been very slight, for the tumor was readily brought out of the wound. During manipulation the cyst burst. The Fallopian tube was examined and found to be normal. It was therefore decided to only remove the diseased ovary. After replacing the tube with the ovarian stump the appendix was next brought out of the wound and examined. It seemed to be free from adhesions and to all appearances perfectly normal. Hence it was dropped back without further molestation. The peritonæum

was closed with fine catgut, the fascia was united with chromicized catgut after Noble's method, and the integument was brought together with silkworm gut, using the subdermic continuous suture. After the operation the temperature never rose above 100.8° F. nor the pulse above 88. The bowels moved on the third day under appropriate medication. On the ninth day there was complete primary union of the wound, and at the end of fourteen days the patient was allowed to sit up in bed.

The three cases seem to me of interest as a group representing two extreme varieties of appendicitis with an illustration of the manner in which the disease may be simulated by other conditions. The last case proves how appendicitis lies on the border line between general abdominal surgery and gynæcology.

I had intended to close my paper at this point, but another case came under my care on very short notice, and I trust you will pardon me for imposing on your good nature and allow me to illustrate by it one other variety of appendicitis.

Case IV.—On May 1, 1897, I went on service at the New York Frauenklinik, and at the time of my visit I was requested by my predecessors, Dr. L. J. Ladinski and Dr. E. Sternberger, to take charge of an urgent case of recurrent appendicitis with probable periappendicular abscess in one of our nurses. She had been operated upon about a year previously by one of my colleagues at the Beth Israel Hospital in my presence, at which time, owing to her debilitated condition, it was deemed sufficient to evacuate the pus and excise the most accessible portion of the gangrenous appendix. She made a good recovery, and up to two days previously she enjoyed tolerably fair health and attended to her duties as a nurse. Acute pain suddenly returned, and with this temperature and localized tumefaction. I saw her about forty-eight hours after the first symptoms of the relapse and coincided with the views of my colleagues that there was no time to be lost.

With a temperature of 102° F. and a very rapid pulse (at one time 160 in a minute) she was put under the influence of ether anæsthesia and an incision parallel to the former scar was made. There was considerable difficulty in getting into the peritoneal cavity,

because of the adhesions of the gut to the abdominal wall resulting from the former operation. After half an hour's work, however, this was accomplished. At one point it was necessary to cut through contiguous adherent structures in the abdominal wall in order to avoid tearing a hole into the intestine. After separating adhesions binding the coils of intestine to each other a small abscess was found behind the cæcum. This must have contained about half an ounce of pus. The surrounding gut was separated for several inches in different directions, but no other pus collections were met. The stump of the appendix was examined and a perforation found just at its point of origin from the cæcum. It was removed after ligating its base, and the remaining fragment was cauterized with pure carbolic acid.

At the close of the operation the patient's condition was better than at the beginning. After twenty-four hours the temperature had remained below 101° F., and the pulse at about 120. The bowels had moved slightly after the use of calomel, sulphate of sodium, and enemata. At the end of forty-eight hours the dressing was changed and the wound had a healthy appearance. She now presents every indication of a speedy recovery.

While appreciating that nothing new has been brought out by the description of these cases, I can not help but feel that it must be of interest for one practising gynæcological surgery to meet four different types of appendicitis cases in almost as many weeks. As I grow older in surgical experience, it seems to me that appendicitis becomes less and less of a medical disorder, and more and more surgical in character. I do not deny that there are cases of appendicitis which yield to rest in bed, combined with the local application of ice. But I have known several cases to require secondary operations in later years. I know also of one case of recurrent appendicitis proving fatal during the second attack.

The first two cases described to-night represent extreme varieties of appendicitis. The first patient was a "walking case," and her trouble was diagnosticated as an ordinary form of "catarrhal appendicitis." The

operation demonstrated the existence of ulcerative and periappendicular inflammatory processes. Still, I am willing to concede that even without operation she might have gone on to spontaneous recovery. In the second case, however, the utter uselessness of medical treatment after the fourth or fifth day of the disease was clearly proved. The boy's life was certainly saved by prompt surgical intervention.

The third case illustrates how a diseased ovary located in the region of the appendix led to an error in diagnosis. The treatment, however, was justifiable, as the inguinal incision not only permitted of a careful examination of the normal appendix, but also of the proper treatment of the diseased ovary.

The fourth case was operated within forty-eight hours of the onset of the attack. An ulcerating stump was discovered with a pus cavity. It proves the justifiability of such extremely early surgical intervention. Still, I believe that such cases must be excessively rare.

Fracture of Both Patellæ; Wiring.—Dr. T. A Smith presented the history of a patient, forty-five years of age, who had been admitted to Bellevue Hospital, in the service of Dr. Phelps, on March 1, 1897, with the following history: He had slipped on the ice and, in falling, had felt his right patella snap. He had managed to get to the nearest elevated railroad station and into a train. As he was taking his seat he had felt his left patella snap, and had fallen to the floor. He had been unable to rise, and had been brought to the hospital at once. Examination had shown both knees slightly swollen, and but little ecchymosis about the joints. There was a transverse fracture of both patellæ, with half an inch separation of the fragments. The knees were bandaged tightly and posterior splints applied. On March 12th, Dr. Phelps being present, both patellæ had been operated upon. In each case the torn capsule had been so infolded over the fragments that proper apposition of bony surfaces would have been impossible without an operation. The fragments had accordingly been brought together by means of silver wire, size No. 4, and the wounds closed. Drainage-tubes had been left in the joints for thirty-six hours. At the end of three

weeks lateral movement of the patellæ had been commenced. On the twenty-ninth day the patient had sat up in a chair, and the next two days he had walked about the ward with crutches. On April 13th, thirty-two days after the operation, he had walked about the ward without crutches or stick. Every day forcible flexion of both joints had been made, and on April 18th he had had ninety degrees of flexion in his right knee, and over seventy degrees of flexion in his left knee. On April 26th, after having walked about the yard, he had come back to the ward complaining of pain in his left knee. Examination had shown this to be red, swollen, and œdematous, with half an inch of separation of the fragments. He had been at once put to bed and an ice-cap applied to the knee. Two days later the fragments had been rewired, the first wire having broken. As soon as the joint had been opened it had been evident that bony union had taken place after the first operation. The joint cavity had been full of blood-clot, and there had been much oozing from the fractured surfaces of the bone. The capsule had not been torn. Since this operation he had done well, the wound having healed primarily, and at the end of two weeks lateral motion would be commenced. The refracture of the patella had probably been due to forcible flexion, made that morning before the patient went out for a walk. While walking around the wire suture had broken.

Dr. Charles Phelps said that he had never seen just such a refracture. On two or three occasions he had refractured the patella in order to get better motion of the joint. The first time it had occurred accidentally while using a good deal of force, the patient being under an anæsthetic. Since that time, he had, in at least three instances, purposely refractured the patella. The case just reported had demonstrated that in such a refracture there was no danger of the infolding of the ligament, and consequent failure of osseous union.

Paper.

A UNIQUE CASE OF INTESTINAL FISTULA.

By LUCIUS W. HOTCHKISS, M. D.

MINNIE S., twenty-five years of age, single, a factory girl by occupation, was transferred in the ambulance from the Magdalen Home to the J. Hood Wright Memorial Hospital on January 10, 1897.

She had been a patient during the service of one of my colleagues about a month before, and had been discharged December 15, 1896.

At this time she was suffering from a severe attack of intestinal colic and from an ulceration of the skin over the site of an old ventral hernia in the median line of the abdomen, below the umbilicus.

She said she had been operated upon four separate times between 1890 and 1894, and that both ovaries had been removed. As a result of these numerous operations a ventral hernia had developed. An attempt to relieve this by operation was made in 1895, but with what degree of success does not appear from the patient's statement. In 1895, after lifting a heavy weight, one of the old scars in the abdominal wall broke open, and, according to her statement, some intestine escaped. This was replaced and the wound sutured, but the hernia remained. She has worn an abdominal supporter since then, and has been fairly comfortable except for occasional attacks of abdominal pain. Just before the time of her first admission to the hospital an abrasion of the skin over the hernia had become infected and an ulcer formed. As a result of rest in bed and local treatment the ulcer had healed and the patient was discharged.

She remained well until about a week before the date of her second admission to the hospital, when an abrasion again appeared in the skin over the ventral hernia, which seemed to be due to the irritation of the supporter. This abrasion did not heal, but became infected and formed an ulcer which discharged a little pus but did not trouble her otherwise, until, on the day before admission, while engaged in shaking a carpet, she felt something give way at the seat of the ulcer. On examination she found the ulcer torn open and bleeding very freely. She went at once to bed, but lost considerable blood from the ulcer during the rest of the day and night. The next morning she was transferred

to my care in the hospital. On admission the patient complained of severe colicky pains in the abdomen, of general abdominal tenderness, which, however, was especially marked in the right iliac region, and of pain in the back.

There was some slight tympanites, and the patient had had two or three loose movements and passed considerable quantities of gas at intervals, which relieved her pain somewhat. While coughing, some bubbles of gas were observed to escape from the bottom of the ulcer.

The abdomen was not distended, and there was no diminution of liver dullness. Heart and lungs negative. Urine contains no albumin. Temperature, 102° F.; pulse, 100; respiration, 30.

An examination of the abdominal wall revealed an area of very thin, parchmentlike skin of about the size of the palm of the hand and bounded laterally by perpendicular scars, which resembled false keloid in appearance. This thinned, pigmented area of skin lay below the umbilicus in the middle line and formed the outer covering of a fair-sized ventral hernia. The fingers could easily be pushed between the widely separated recti muscles, and the intestines plainly felt through the thin cicatrix to which they seemed adherent beneath.

The ulcerated surface was at about the centre of this area and a few bubbles of gas were seen escaping, though no communication with the intestine was at this time demonstrated. The patient was kept quiet in bed. Morphine was administered and the ulcer dressed with sterile gauze.

January 11th.—After giving an enema the dressings were found saturated with a dark-brown fluid. Temperature went to 101.4° in the afternoon, and there was considerable abdominal distention with tenderness in the upper part of the belly, *i. e.*, in the epigastric region. By the 16th the pain had considerably diminished and the temperature had reached normal. Her condition generally had improved. On the 20th, 21st, and 22d the patient had a great deal of abdominal pain again, and considerable morphine was used to give her relief.

The fistula continued to discharge rather profusely, and the skin became excoriated. On the 22d the dressings were saturated with blood. On the 24th a formed fæcal movement was found in the dressings. On the 26th particles of matter, thought to be partially digest-

ed food, were discharged through the fistula. As the patient seemed to be steadily losing ground, and as the mucous membrane of the underlying intestine protruded from the wound, there was thought to be very little chance of effecting a closure of the fistula by conservative means. The opening into the gut, moreover, was flush with the skin and would readily admit the finger. The patient was very anxious for an operation, and this was undertaken with a view of closing the intestinal fistula and at the same time accomplishing, if possible, the radical cure of the ventral hernia.

28th. Resection of Gut; Circular Enterorrhaphy (Maunsell's Method); Repair of Ventral Hernia.—The patient having been anæsthetized with ether, the fistulous opening into the gut was stuffed with sponges and the surrounding area of skin thoroughly cleansed. An elliptical incision wide enough to include the fistula and all old scar tissue—*i. e.*, about four inches and a half by three inches—was made and the peritoneal cavity opened. The loop of intestine in which the fistula was situated was firmly adherent to the overlying cicatrix for a distance of about two inches and the opening in it was too large to admit of any operation short of resection and suture. To the loop of gut just described were adherent two other portions of intestine, but the adhesions were not very firm and were easily separated, being apparently of recent origin. The intestines generally in the neighborhood were tied together with firm adhesions, most of which were left undisturbed.

The affected portion of gut (ileum) having been pulled out and isolated, and the peritoneal cavity protected by gauze pads, a piece about four inches in length was excised. The cut ends were joined together after the method described by Maunsell, and a few additional Lembert sutures were used. The sutured gut having been washed with peroxide of hydrogen and afterward with hot sterile salt solution, was dropped back into the peritoneal cavity. A flat gauze pad having been introduced into the abdomen to hold back the intestines, an attempt was made to do a radical operation for the relief of the hernia. The edges of the recti were found widely separated and buried in cicatricial tissue. They were exposed with some difficulty, and their broad freshened edges brought together by heavy catgut sutures.

The superficial structures at the upper end of the wound came together nicely. Below, the skin edges

would not meet without too great tension. The lower end of the skin wound was accordingly left partly opened.

The patient rallied well from the operation. There was very little shock.

For the first forty-eight hours she was fed by the rectum; after that, fluid diet was allowed. On the 6th of February all superficial sutures were removed. Union in the deeper parts seemed firm. Lower part of skin wound granulating aseptically. By the 21st the wound had closed. On the 6th of March the patient was discharged "cured," the wound firmly united throughout, and no evidence of hernia at the site of operation wound.

The wound pursued an aseptic course throughout, and, although the patient's convalescence was disturbed by frequent attacks of abdominal pain, these became less as time went on, and at the time of her discharge the patient was free from them. The numerous adhesions between the coils of intestine evidently disturbed peristaltic action and will perhaps explain the severe colics to which she was subject.

Although ulceration from within the gut is described as one of the frequent causes of fæcal fistula, ulceration from without, involving the intestinal wall and leading to the formation of fistula, must be very rare. In this respect at least the case seems to be unique and worthy of record.

The skin which covered in the ventral hernia in this case was so very thin and the intestine beneath so adherent that any ulcerative lesion affecting the former would be bound to involve the latter unless its course was checked. It is possible to explain the formation of fistula in this case, I think, by assuming that the intestinal coat was more or less involved by the extension of the ulcerative process from the skin, and that the strain which opened up the ulcer may also have partially ruptured the gut.

The ulcer was evidently the result of simple pyogenic infection through an abrasion, and its extension due to the lack of vitality in the thin cicatrix. The case has interested me very much, and so far I have been unable to find the description of one exactly similar.

Dr. Frederick Holme Wiggin congratulated Dr. Hotchkiss on his success. He said that the method of Maunsell was gaining ground rapidly, and was better adapted to the purpose, in many cases, than any mechanical device. He had in the last few years operated upon a good many cases of ventral hernia following laparotomy, and had generally succeeded in overcoming the difficulty by excising the thin overlying skin, and dissecting and separating the various layers that surround the edge of the opening, so as to restore their anatomical relations before commencing to suture them. These cases had healed without difficulty, and the hernia had been cured. He was surprised that the president had objected to giving his patient nourishment by the stomach for a number of days after the operation. About two months ago he had presented a specimen from a case in which this same operation had been performed. Four days after the operation he had considered it necessary to open the abdominal cavity, owing to symptoms of intestinal obstruction, and he had found a flexure of the gut below and adhesions from a small abscess of the mesentery. The point of union could not be distinguished by sight from other portions of the gut, so perfectly had the peritonæum been regenerated. He had also some time since presented another specimen from a patient who had died sixty hours after the operation. In that case two Murphy buttons had been used, and one of these being too large had led to the patient's death. From experiments that he had made on dogs he believed that within twelve hours there was very fair union. So firm was this union that he saw no objection to using cathartics after sixty hours. It had been his practice to give hypodermic injections of morphine to patients upon whom he had performed intestinal anastomosis, yet most of these patients had had movements of the bowels, in spite of the opium, within two or three days. In a recent operative case out of town he had specially requested the surgeon in charge not to give a cathartic, but to give opium; however, the record showed that on the second or third day the bowels had been moved by cathartics without bad result.

The President said that his patient had been given food by the mouth within forty-eight hours. As there had been many adhesions in the abdomen, and the intestine had been handled considerably during the operation, he had thought it advisable to be cautious. The treatment of the hernia in this case had seemed rather

difficult, because the rectal muscles had been so widely separated that it had been with great difficulty that they had been brought into the field of operation and approximated. A cure had been effected, although the superficial tissues could not be brought together. The woman had been perfectly strong and well on leaving the hospital.

Tuberculous Kidney.—The PRESIDENT presented a specimen of tuberculous kidney removed from a patient who had been admitted to hospital last summer. The family history had been markedly phthisical, and he had himself had pneumonia. Two weeks before admission his urine had suddenly become scanty, without known cause. Examination of the lungs had disclosed a dull tympanitic note over the right apex, with a slight increase in voice and breathing. Over the left apex the whispered voice had been increased. There had been a tympanitic percussion note over the lower half of the axillary space. A harsh, blowing, systolic murmur had been heard in the third left interspace, about an inch from the sternum. Some tenderness and rigidity had been present in the left half of the abdomen, and in the left hypochondriac and left lumbar regions had been a tumor which was tender on pressure. On July 5th, under ether, the usual incision had been made for lumbar nephrectomy; an enormous collection of pus had been evacuated, and a small tuberculous kidney removed. The patient's condition before and during the operation had been exceedingly bad. Accordingly, two or three quarts of salt solution had been injected into the subcutaneous tissue. He had come out of the shock and had made a good recovery, but had developed numerous abscesses at the site of the subcutaneous injections. He now reported himself as perfectly well.

Paper.

BUNION: ITS ÆTIOLOGY, ANATOMY, AND OPERATIVE TREATMENT.

By PARKER SYMS, M. D.

THE condition to be described is a complex one, involving the structures which form the metatarsophalangeal joint of the great toe, and the superficial tissues in its region.

Bunion was the name originally given to this condition when it was considered to be merely an inflammation of a bursa on the inner side of this joint. Hallux valgus is the proper name of the deformity which is the cause of this bursitis. The bunion is always a secondary condition, and is merely a result of the deformity of the toe.

The name hallux valgus should displace the popular term bunion, but it probably will never do so with the laity. By hallux valgus is meant an outward displacement of the first phalanx of the great toe to a greater or less degree, varying from a slight divergence from a straight line to a divergence equal to a right angle.

The cause of this deformity of the foot is the wearing of shoes which are faulty in shape or are ill fitting. A shoe that crowds the toes together or pushes the great toe backward will tend to produce this trouble. In this class are shoes with the following characteristics: First, shoes with narrow points, with the point in the median line; second, shoes that are too short; third, shoes that are so loose at the instep as to allow the foot to ride forward, and thus bring direct backward pressure on the toes; fourth, the worst of all, are shoes which combine two or all of these defects. Some pointed lasts are so constructed that the point is on the inner side of the shoe, and the toe is not necessarily displaced.

This deformity has been ascribed to osteoarthritis, to suppurative arthritis, to rheumatism, and to gout; but bad shoes are its cause, and the arthritis is the result of the displacement they produce, and of the injury they do to the joint. From the nature of the cause, and from the characteristics of this disease, will be readily understood the facts that it is more common in adults than in children, and more frequently found among women than among men.

The condition will vary a good deal in different instances. In mild cases there is but slight deflection of the toe outward, and little or no dislocation. This

deflection allows the pressure of the shoe to come on the inner side of the head of the metatarsal bone, and the consequent irritation will result in a periostitis and a hyperplasia of bone at that site, finally amounting to

FIG. 1.—Type of hallux valgus. Shows: *a*, hypertrophied end of metatarsal bone; *b*, hypertrophied "condyle" on inner side of metatarsal bone; *c*, outward displacement of phalanx; *d*, inward displacement of metatarsal bone; *e*, partial dislocation of phalanx.

an exostosis. Ere long the pressure between the exostosis and the shoe will produce an inflamed bursa, and there is then a mild case of so-called bunion.

A more advanced case will show a decided hypertrophy of the whole inner side of the head of the metatarsal bone, resulting in its elongation as well as its thickening, so that added to a marked prominence over the joint there is a decided change in the direction of the articular surface, and a consequently increased valgus.

From this stage or degree on, the increased deform-

ity is owing rather to pathological changes than to mechanical conditions. A chronic arthritis is established. The internal lateral ligament is stretched, the external one is contracted. The joint surfaces may become eroded or eburnated. The weakened support finally allows complete dislocation, so that the toe will lie at an angle, perhaps a right angle, across its fellows. The tendons will of course become displaced. Some

FIG. 2.—Shows: *a*, hypertrophied end of metatarsal, *b*, hypertrophied condyle on inner side of metatarsal; *c*, outward displacement of phalanx, *d*, inward displacement of metatarsal bone; *e*, partial dislocation of phalanx.

surgeons have made the mistake of considering the displaced sesamoid bones (in the tendons of the flexor brevis) as the cause of the trouble and not as one of the results.

There is a general hyperplasia of all the tissues about the joint, besides the thickening of the bone itself. There is also a displacement of the metatarsal bone inward, so that there is quite a wide gap between the first and second bones.

The bursa continues its annoying course, being the seat of a chronic remittent inflammation with severe exacerbations. When it becomes duly infected it will

suppurate, and if not properly opened will infect the joint either by extension or by rupture into it. In some cases it will become the starting-point of a severe cellulitis of the foot and leg; in this manner it has proved fatal. There is usually a corn or callosity over the bursa, which acts in concert with the hypertrophied bone beneath it in making the patient miserable.

In many cases hallux valgus is associated with hammer-toe in the second and third digit, which results from the same cause.

Fig. 3.—Skiagraph taken after operation in a case where there was—*a*, complete dislocation of phalanx; *b*, toe adducted to right angle to metatarsal bone; *c*, great hypertrophy of end of metatarsal bone; *d*, greatly hypertrophied "condyle" on metatarsal bone.

In Case III the clinical result was perfect as to shape and position of toe, cure of bunion, and restored function.

Operation was resection of head of metatarsal and of the hypertrophied lateral mass.

In cases of long standing the joint may become fixed by a true or false ankylosis, and all the symptoms of the acute attacks may cease, nothing remaining but the deformity.

The deformity will depend upon the duration and severity of the case, and need hardly be further dwelt upon here. It is the outward expression of the ana-

tomical changes already described. There will be added to this either complete or partial loss of joint function, always limited motion, joint crepitus, and tenderness.

The subjective symptoms consist in pain, tenderness, the consequent disability, and a peculiar shuffling gait. Of course, these conditions are exaggerated during an acute attack of inflammation, but except in cases of long standing in which ankylosis has taken place these patients are constant sufferers.

Very early cases may be relieved and farther progress stopped by careful attention to the shoes. A slight degree of deformity may be corrected by means of pads or splints which will place and retain the toe in its proper position; but a well-advanced case will not be cured by any means except an operation.

An acute attack of inflammation should be treated by rest, disinfection, and the application of such an evaporating lotion as the liquor aluminæ.

Probably viewing this disease from various standpoints has led surgeons to employ quite widely differing methods.

Ullmann * has advised a very elaborate procedure, consisting in arthrotomy, ablation of the sesamoid bones, and a transplantation of the tendons. Riedel † recommends a longitudinal osteotomy of the inner side of the metatarsal bone, and excision of the base of the first phalanx. Some have advised simple transverse or cuneiform osteotomy of the shaft of the metatarsal bone above, and not entering the joint. Fowler ‡ recommended a resection of the head of the metatarsal bone. He made use of the incision between the first and second toes, as devised by Peterson ‖ for arthrectomy of this joint in cases of tuberculosis.

Dr. Robert F. Weir has recently described before the New York Surgical Society an operation similar to, but

* *Wiener med. Wochenschrift*, 1894, No. 49, 2089.

† *Centralblatt für Chir.*, No. 44, October 30, 1886.

‡ *Medical Record*, 1889, vol. xxxvi, p. 253.

‖ *Archiv für klinische Chirurgie*, Bd. xxxvii, 677, 1888.

much more comprehensive than, the operation of Ullmann.

Most authors advise removal of the bursa by careful dissection.

My own experience with these cases has taught me to be guided by the following principles: First, to employ different operative procedures according to the degree and character of the deformity.

Second. Never to operate during an acute attack of inflammation.

Third. Always to treat the deformity, and never operate on the bursa, for it will take care of itself after its cause is removed. The exceptions to this rule are the removal of callosities from the bursa when they exist, and the incision of bursæ when they suppurate.

Fourth. Never to make the operation incision around the bursa or through the bursa for two reasons: first, because it would leave a scar where the shoe presses most; second, the operation would be through an area of infected tissue.

Fifth. Never use an Esmarch's bandage.

Sixth. Close the wound by suture, without drainage.

Seventh. Give careful attention to the after-treatment. Proper shoes must be worn, or a relapse will be probable.

I have found an incision about an inch in length on the dorsum of the toe thoroughly satisfactory. In a mild case, after retracting the tendon of the extensor proprius pollicis outward, I chisel off all the over-prominent portion of the inner side of the head of the metatarsal bone, removing as much bone as is necessary to do away with all protuberance. Then suture the wound and let it heal under one dressing. Usually the patient can walk about after the first week.

In more severe cases, where there is a marked adduction as well as lateral dislocation, I remove the head of the metatarsal with a chisel or bone forceps, and also cut off the prominent inner side of that bone. To resect the head of the metatarsal bone it will be

necessary to divide the lateral ligaments and completely dislocate the toe. This can be done with ease and satisfaction through the simple straight incision I have described. It is necessary to remove so much bone that the toe will readily come into place and have no tendency to displacement. If this is not accomplished by the first ablation more bone must be removed.

The dressing must be carefully made so as to hold the toe in good position. I always secure the toe by means of pads and put a plaster-of-Paris bandage over the entire dressing. I use catgut sutures, and leave the original dressing on two weeks. I encourage the patient to walk in the third week. For some time the toe will be liable to displacement, and a good result can not be expected unless the after-treatment is carefully carried out. In my experience it is seldom necessary to do this resection of the head of the bone.

A thorough removal of the inner "condyle" will cure the majority of cases. The skiagraph will show this to be the case. It will also show that the simple removal of the end of the bone is not sufficient; there must be a removal of all the overprominent lateral mass.

Dr. Walter C. Wood said that he had operated with equal success by the dorsal method and by the incision between the first and second toes, but he thought the dorsal was the easier operation. It was an easy matter to miss the joint by the other method. He had learned to keep as far away as possible from the bursa.

Dr. Gouley spoke of the extreme cases in which the great toe lay across the other toes. It was proper, he said, to caution inexperienced operators against doing too much. It would be a very dangerous thing for the foot if the whole of the head of the metatarsal bone were removed, for this had been shown to be one of the legs of the tripod of the limb. If the whole of the head of the metatarsal bone were removed walking would be rendered very difficult. Accordingly, only the upper and anterior portion should be removed. Enough could be taken away on the anterior or upper portion to render replacement of the phalanx comparatively easy, and an incision not over an inch long was ample for the

purpose. The essential point in the operation was to preserve this part of the tripod.

Dr. Louis A. de Zerega asked if Dr. Syms had found it necessary to use the Esmarch bandage in these operations.

Dr. Syms replied that his operations on these cases had been practically bloodless, the only bleeding being from the division of the bone. He was strongly of the opinion that the healing was much better when the Esmarch bandage was not used, and he had had two severe hæmorrhages from the use of this bandage.

Dr. W. J. Chandler, of South Orange, said that he had always used the Esmarch bandage as a matter of convenience, and had never been troubled with hæmorrhage after its use. He had made use of the incision between the great toe and the second one; he had never tried the dorsal incision. In all of his cases there had been primary union, although he had seen one or two cases of extensive suppuration in the practice of others.

The President said that in one case he had been obliged to excise the greater part of the head of the first metatarsal bone. In order to avoid excising more, he had removed the proximal end of the phalanx. This had resulted in shortening the great toe, but had given not only a perfectly movable joint, but a short and straight toe.

Dr. Syms said that he desired to emphasize the importance of selecting the location of the incision. The one in the commissure between the toes, as recommended by Dr. Fowler, was a thoroughly good one, but the one on the dorsum of the toe gave a perfect exposure of the entire joint and all the tissues necessary to reach it. The importance of avoiding making the incision at the inner portion of the toe was obvious—the cicatrix would then come under the direct pressure of the shoe, and a painful condition might exist after the operation. Each case should be individualized, and only as much diseased or deformed tissue removed as was necessary. It was absolutely essential to keep on removing the bone until it could be straightened, and maintained in this position without much force. In many of the severe cases it was undoubtedly necessary to remove the entire head of the metatarsal bone. It was well to avoid the elaborate and complicated procedures described by Dr. Ulmann and Dr. Weir, which consisted in making a complicated incision halfway round the bursa, dissecting out the bursa, making another incision on the outer side of the toe,

resecting the toe, separating nearly all the tendons about the toe, and arranging them into new positions, and taking out the sesamoid bone.

Ruptured Kidney.—Dr. CHARLES PHELPS exhibited a case of ruptured kidney. The accident was supposed to have resulted from a kick. On arrival at the hospital the man's urine had been drawn by catheter, without difficulty, and had been found largely mingled with dark, perfectly fluid blood. The case had been thought to be one of rupture of the kidney, but as he had had no constitutional symptoms it had been thought possible that no interference would be demanded. During the night the nurse had noticed, however, some abdominal swelling, and in the morning he had passed water once without assistance. On the evening of the first day his temperature had been normal. The next afternoon both temperature and pulse had risen; the abdomen had been tender and tympanitic, and it had seemed evident that there was some abdominal lesion in addition to the injury to his kidney. After some delay the patient had consented to an operation. A lumbar incision had revealed a large amount of blood in the abdominal cavity. The bladder had not been injured. It had been difficult to discover the source of the hæmorrhage, which had continued to be copious, and before the conclusion of the operation the patient had died. By an extensive incision, made immediately afterward, it had been ascertained that the hæmorrhage had ruptured the parietal peritonæum, and in that way had found direct access to the abdominal cavity. The peritoneal tissues had been filled with blood. The rupture had been in the anterior part of the kidney. The only other abdominal lesion had been a contusion of the cæcum, and one or two slight contusions of the ileum. The coroner had subsequently found that the man had had but one kidney.

Meeting of June 2, 1897.

The President, Dr. LUCIUS W. HOTCHKISS, in the Chair.

Papers.

REPORT OF A CASE OF CONSECUTIVE TUBAL PREGNANCY, WITH RUPTURE IN EACH TUBE WITHIN FOURTEEN MONTHS.

BY JOHN F. ERDMANN, M. D.,

PROFESSOR OF PRACTICAL ANATOMY IN BELLEVUE HOSPITAL MEDICAL COLLEGE; ATTENDING SURGEON TO ST. MARK'S AND GOUVERNEUR HOSPITALS.

ALTHOUGH the literature of the past few years is replete with reports of cases of extra-uterine pregnancies, reports of consecutive tubal pregnancies are rare. The case which I report presents an involvement of both tubes within fourteen months, operated upon successfully, and also operated upon in the interval of extra-uterine pregnancies for an umbilical hernia, which followed as a result of the first operation.

The history is as follows:

Mrs. A. O., a Polish Jewess, twenty-seven years of age, was brought to Gouverneur Hospital February 13, 1896, in a state of profound hæmorrhagic shock. Her personal history, obtained from her friends, was the following: She had been feeling ill for about two weeks previous to admission, and had not menstruated for six weeks, but for a few days had been having a bloody discharge from the vagina, but not characteristic of menses. Upon examination she presented all the usual appearances of an extensive hæmorrhage except the presence of blood. Pulse was 140, respirations rapid and shallow, thirst, etc. Temperature, 97.5°. Vagina and vulva were bathed in a discharge resembling disintegrated blood. Digitally, a small doughy mass was felt in the right pelvic region. As we were unable to obtain any further history, a diagnosis was made of possible rupture of a tubal pregnancy, and immediate preparations were made for suprapubic cœliotomy.

Previous to and during the operation six pints of normal salt solution were injected into the subcutaneous tissues. Upon incising the abdominal wall in the median line, and just before opening into the perito-

neal cavity, dark semifluid material was observed through the peritonæum. As the peritonæum was opened hurriedly a large quantity of blood and clot was expelled. The hand was passed rapidly to the right side of the uterus and grasped a mass about two inches in diameter; this was brought to the surface of the abdominal wall and found to be a ruptured tubal-gestation sac, with the fœtus in the intact membranes protruding from the rupture. The rupture was within half an inch of the uterus and bleeding profusely. Hæmorrhage was checked by compressing the mass with the hand, then a clamp was applied, and a ligature thrown about the proximal end of the tube. The peritoneal cavity contained fully two basinfuls of blood and clot. Owing to the rupture being so close to the uterus as to prevent trusting to a ligature remaining upon the stump, the clamp was left after the tube and ovary were removed, and a large gauze tampon was placed down to the pedicle surrounding the clamp. The patient was put in bed in profound collapse. Another reason for the gauze tampon was that we had just finished dressing two septic cases of appendicitis, and it was feared that in our hurry infection might possibly have occurred.

The patient responded very well within a few hours. Clamp and tampon were removed within forty-eight hours, and a small tampon inserted. An uneventful recovery took place, the patient being discharged March 28th, about six weeks after the operation.

As a result of the injection of salt solution into the groins, and evidently due to air accidentally introduced (Allen pump being used to inject the salt solution), an emphysematous crackling persisted for over two weeks at the sites of the injections. No evil result followed this emphysema.

During her convalescence her previous history was obtained, and is as follows: Family history good.

Personal.—Denies all specific and constitutional disease. Menstruated at seventeen, always without any difficulty. Married at twenty-one; has one child living, and had a prolapse of the uterus, for which she was treated without operation in a hospital in another State. One miscarriage at three months after this treatment.

On November 30, 1896, I saw her for the first time following her discharge from the hospital and found

a small hernial protrusion at the site of that part of the wound through which the clamp and gauze had been introduced.

She was operated upon on December 4, 1896, at which time quite extensive adhesions were released. She was discharged on the 20th of December, 1896, with a perfect result.

April 18, 1897.—The patient was again seen by me and in a condition analogous to that of February 13, 1896, with an additional symptom of marked pain, chiefly upon the right side and in the neighborhood of the appendix vermiformis. The discharge from the vagina was black, tarry, and very foul. Patient presented symptoms of sepsis.

Previous history was as follows: Peculiar painful sensation on April 13th in the abdomen. Vomited several times and was constipated. Considerable thirst on the 14th and felt very weak. April 16th, feeling a little better, she arose and did some of her housework. Grew worse on the 17th, and on the morning of the 18th she was found in collapse and brought to the hospital.

Upon examination a mass about three inches long could be felt on the left side through the abdominal wall, but nothing through the vagina. The uterus was thoroughly curetted and irrigated. Vagina made antiseptic. Owing to the adhesions found at the time of the operation for the hernia, it was deemed advisable to save time and difficulty by opening the abdomen through the left rectus. This was done rapidly. Large quantities of blood and clot were found in the peritoneal cavity, and a mass about two inches and a half in diameter connected with the left tube was brought out of the wound. Rupture in this instance was at about the middle of the tube; blood clot and macerated material was all that was found in this specimen. The tube and ovary were tied off with catgut. After washing the peritoneal cavity, but not obtaining an absolutely clean toilet, we searched for adhesions and were astonished to find an absolutely free condition in the intestines, while connected with the uterus one band only, and that but the size of a very coarse cotton thread, was found between the fundus and the parietal peritonæum.

The wound was then closed with catgut, with the exception of its lower angle, through which a Mikulicz tampon was introduced. Vaginal drainage was made

and the patient taken to bed. During the operation I was indebted to Dr. F. Huber for his able assistance in injecting into the tissues of the patient five pints of salt solution.

For a few days the patient's temperature was of a septic character, then became normal, and she was discharged from the hospital May 20, 1897, with a small granulating wound at the lower angle of the incision.

During convalescence from the operation she states that her last menstrual flow took place on March 22, 1897.

Suprapubic cœliotomy was performed in both instances as a result of the marked evidences of hæmorrhage which we supposed to be in the active state, and we feel satisfied that had the vaginal route been accepted in either case the result would not have been so satisfactory. Vaginal drainage was made in the second operation because of the foul odor to the discharge found in the vagina and also of the septic appearance of the patient.

Paper.

PASTEURIZED MILK AS DISPENSED IN YONKERS, AND A STUDY OF THE EFFECT ON INFANT MORTALITY.

By S. E. GETTY, M. D.,
SURGEON TO ST. JOHN'S RIVERSIDE HOSPITAL, YONKERS.

Digestive troubles among children are so prevalent and fatal during the summer months in our cities that it has become of the utmost importance that the causes should be investigated and determined and a remedy found that would reduce the mortality. It is a problem the solution of which demands our best thoughts and most vigorous action.

We can not pull down the tenement houses and compel the people occupying them to move into the country, nor can we educate these people immediately in the hygienic art of living. If we could say to the milk dealer, You must keep your cows clean and in good health and insure a pure milk only being sold to

the public, much might be accomplished, but all this takes years and many workers; meanwhile hundreds and thousands of children's lives are being sacrificed annually. Too much credit can not be given Mr. Nathan Straus for having been the first one to put into practical operation a plan whereby these disadvantages can be overcome, and we wish now to acknowledge the many practical points received from him as well as the original idea, that the use of pasteurized milk is the means easiest adopted and best adapted to overcome the many difficulties that confront us in solving this problem. With the object of reducing infant mortality from digestive troubles in the city of Yonkers, the Sterilized Milk Dispensary of St. John's Riverside Hospital commenced work on July 14, 1894.

The general plan of running the dispensary in 1894 and 1895 was the same as the Nathan Straus depots in New York, a description of which, written by Dr. Roland G. Freeman, has appeared in one of the journals (*Medical Record*, August 4, 1894). The milk during these two years was supplied by local dairymen, but was, on the whole, not thoroughly satisfactory, and we realized early in our work the great desirability and actual necessity of controlling a dairy where every effort would be made to produce pure milk, drawn from healthy and properly fed and groomed cows. Before beginning work for the season of 1896 it was decided to obtain control of a dairy, but what dairy it was a difficult question to decide, as so much of the success of the work depends upon a pure milk at the source of the supply.

A large number of dairies were inspected, and numerous talks with farmers disclosed a surprising amount of ignorance and carelessness on their part, not only in regard to the care of the milk and utensils, but also about the stabling, feeding, and health of cows.

An agreement was finally made with the manager of the Briar Cliff Farm at Whitsons for the supply. The cows selected were a cross between Holsteins and natives, and Guernseys and natives, and they were all

given the tuberculin test and found to be free from tuberculosis. The stables were critically examined in regard to light, air space, and drainage, and found to be models of their kind, and were kept in a perfectly hygienic manner. The water used by the cows for drinking purposes, also that used for washing the milk pails and cans, was analyzed and proved satisfactory. The pastures were gone over carefully to detect noxious weeds. The greatest care was taken at milking time to keep the milk free from dust and dirt; before each milking the cows were groomed and the udders thoroughly wiped, and after this duty was performed the milkers washed their hands and put on their milking suits. After being drawn the milk was rapidly cooled, and all care taken to keep it cool and free from contamination until ready for shipment. Only the afternoon's milk was sent to us. The one thing feared was the railroad journey at night of one hour in a refrigerator car, but no ill effects were discovered from it. The train was met on its arrival by the dispensary wagon and, after a short drive, the milk was immediately transferred to a refrigerator. Pasteurization began at 5 A. M., and at that time the milk was thirteen hours old. This coming season pasteurization will commence at 12 midnight, as we have become convinced that the fresher the milk the better the result will be. If this is done the milk will be but eight hours old, and it would better suit our purpose if the milk were only one or two hours old.

An average analysis of the milk received was: Lactometer, 114; fat, 4.6; proteids, 3.17; sugar, 4.87; ash, 0.60; total solids, 13.24. Bacteria, 15,400 to 1 c. c. when seventeen hours old. Leeds gives an average analysis of good bottled milk: Fat, 3.75; proteids, 3.76; sugar, 4.42; ash, 0.68; total solids, 12.61.

(In 1892, Sedgwick and Batchelder examined a large number of specimens of milk obtained in Boston and vicinity, for the purpose of determining the number of bacteria present. The average of fifteen samples taken from the tables of persons living in the suburbs

of Boston was 69,143 bacteria to 1 c. c. The average of fifty-seven samples of Boston milk obtained directly from the milk wagons and plated at once was 2,355,500 bacteria to 1 c. c. The average of sixteen samples from groceries in the city of Boston was 4,577,000 bacteria to 1 c. c. Professor Renk found in the milk supply of Halle from 6,000,000 to 30,000,000 bacteria to 1 c. c.)

Three samples of milk obtained in Yonkers showed respectively 1,500,000 bacteria to 1 c. c., 6,000,000 bacteria, and 10,150,000 bacteria to the cubic centimetre. It will be seen from the foregoing that the milk received compared most favorably not only in solids, but in the extremely small number of bacteria, with recognized standards.

A feature of work begun in 1896 was the supplying at moderate rates on physician's prescriptions of percentage milk to the children of the well-to-do. The number of children fed in this manner averaged thirty during the four months the dispensary was open. These prescriptions varied according to the requirements of the child fed, or the judgment of the attending physician. This branch of our work was begun in order that the income would be increased to some extent, also to give the physicians and their patients an opportunity to utilize the facilities of the laboratory. That they appreciated the work of the dispensary is evidenced by the fact that there was no diminution in the number of private orders until the dispensary was closed for the season, and many regrets were expressed both by physicians and patients that the work was not to be continued throughout the year.

For the poor the following formulas are used:

1. Pure milk pasteurized in eight-ounce bottles, at two cents each.

2. Milk and limewater pasteurized in six-ounce bottles, at one cent each, to give fat, 2.3; proteids, 1.68; sugar, 7; neutral or alkaline.

3. Milk and barley water, in equal parts, pasteurized in six-ounce bottles, at one cent each.

4. Plain barley water sterilized in six-ounce bottles, at one cent each.

Arrangements were made with the owners of five drug stores conveniently located near the centres of population by which they took charge of selling the milk without any cost to the dispensary except the ice necessary to keep the milk cool. A deposit of three cents was required on each bottle to insure its return. This plan has worked well, especially for the poor, as they have been enabled to obtain the milk at any hour of the day or night. The unsold milk was returned the following morning and sent to the hospital, and used for cooking purposes.

The reasons why Yonkers was selected to try the experiment were:

1. It is a city of only forty thousand inhabitants, with a large tenement population composed of people of many nationalities—Hungarians, Irish, Russian Jews, and Italians—all ignorant of the first rudiments in the proper care and feeding of infants.

2. In a small community a larger number of bottles could be dispensed *per capita* than in a large city like New York, and the effects would be more far-reaching and evident.

In the four summer months of 1895 64,000 six and eight-ounce bottles were dispensed in Yonkers, while in New York there were 536,000 bottles dispensed from the Nathan Strauss milk depots. If the proportion sold in New York to the population had equaled that sold in Yonkers the sales would have been 3,400,000 bottles in a like period of four months, the amount dispensed in Yonkers being seven times as much as in New York in proportion to population. The sales in Yonkers for the season of 1896 were increased to 78,300 bottles. If the same ratio had prevailed in New York, the sales would have reached the enormous total of 4,000,000 bottles in four months.

3. Owing to the limited size of the town, the effects could be closely observed and the individual cases carefully studied.

Having given a brief outline of the methods employed in the dispensary, and having stated the reasons for starting the work, it is now in order to analyze all conditions which might in any way affect the result sought to be obtained in the reduction of infant mortality from digestive troubles.

On June 1, 1896, it is estimated that there were living in Yonkers 800 children under one year, 750 children between one and two years, and 2,200 children between two and five years—total, 3,750 children under five years of age.

Granting seventy-five per cent. of the children under one year were nursed by their mothers (a high average), this would leave 200 children under one year to be fed artificially, and to this number must be added most of the children between one and two years, say 700, a total of 900 children under two years of age of all classes to be provided with some kind of artificial food.

From an analysis of some thousands of birth certificates we find that sixteen per cent. of the births recorded were in single houses, twenty-four per cent. in flats, and sixty per cent. in tenements. Of the 900 children in Yonkers under two years artificially fed, there are 540 living in the tenements.

The children fed on dispensary pasteurized milk in 1896, allowing six bottles to each child daily, was June, 45; July, 121; August, 150, and September, 111. At a first glance this seems a small proportion of the total to feed, but it must be remembered that, while most of the children living in single houses and small flats received food carefully prepared at home, probably fifty per cent. of the tenement children were fed on dispensary milk at some time during the summer.

An increase of thirty-three per cent. and a third in the sales of milk and limewater from 1895 indicates that a larger number of young children were fed on this milk. Sales of milk and barley water decreased considerably, indicating that the children we were feed-

ing kept well on either the pure milk or milk and lime-water.

Sales of pure milk decreased slightly from the previous season. This is accounted for by the fact that the price was raised from five cents to eight cents a quart. In 1895 it was suspected that some of this milk was used for family purposes; probably very little was so used in 1896.

In order to compare the conditions as they existed in Yonkers before the dispensary was established with the conditions as we find them to-day, after three years of pasteurized milk, I present the following suggestive figures obtained from the official records:

The total number of births reported from January 1, 1891, to January 1, 1896, a period of five years, was 5,009. This does not include any estimate of the children born elsewhere, who moved into Yonkers during this period, nor has any allowance been made for those who moved away during this period. The chances are that the former exceeded the latter to some extent; it will have, however, little bearing on the general result. The number of children under one year who died during the same period was 1,010, showing a mortality of twenty per cent. the first year. The number who died between one and five years of age was 526, making a total of 1,536 deaths in children under five, or nearly one third of the number born, a much higher percentage than that given by Ashbey and Wright of twenty-five per cent.; of this number, 518 died from digestive troubles, or more than thirty-three per cent. of the total deaths from all causes among children under five; 433 died during the months of June, July, August, and September from the same causes, or eighty per cent. of the entire number of deaths from digestive troubles. Forty-five of the children dying from digestive troubles lived in houses containing but one family, 29 lived in small flats, and 444 lived in tenements, showing that eighty-five per cent. of the total deaths from digestive troubles occurred in the tenements. The preponderance of deaths in tenements and in the sum-

mer months is alarming, and shows something radically wrong. Poverty and ignorance were the apparent causes suggested by location, and heat by the time of mortality. As to this latter cause there is room for argument, as I shall show later on. The deaths from digestive troubles among children in Yonkers for June, July, August, and September, 1896, numbered 48, and a tabulation of these deaths was made to learn the kind of food the child received prior to death. There were some other interesting facts brought out by this tabulation, a summary of which I will give you:

Residence: One lived in house containing one family, 2 lived in small flats, 45 lived in tenements—total, 48.

Age: Twenty-four under six months, 16 six months to one year, 6 one year to two years, 2 over two years—total, 48.

Food: Ten breast fed, 2 breast and bottle fed, 34 bottle fed, 2 unknown, probably bottle fed—total, 48.

Of the 48 children, 9 only had pasteurized milk at any time during the summer; six of the children were not put on the milk until they were taken sick, and the length of time they received the milk varied from two to four days.

Two children were given the milk for a while, and later on other food was given until death. One short-term child (eight months) was apparently thriving on the milk when it developed meningitis and died. The physician in attendance says that the milk had nothing to do with the child's death.

From this analysis of the deaths it will be seen that not a single child died in Yonkers that was put on pasteurized milk when it was in good health, and from the evidence of both physicians and the mothers the children kept well on the milk. There are no means by which we can estimate the number of sick children who were cured by this milk; we can only tell of the failures by examining the death certificates.

Much misconception exists among physicians as to just what pasteurized milk is intended to do. When it is given to a healthy child, with a little manipulation

by changing the proportions of the various solids in the milk to suit the requirements of the child, a food will be obtained which will agree with it perfectly. On the other hand, if a child has been fed on some other food and is suffering from infection produced by it, it is the height of folly to give milk of any description to it until we have first cleaned out the entire digestive tract, and have allowed time enough to elapse for the destruction of the harmful bacteria contained in it. The most sterile milk would become infected if we gave it before taking these precautions—it would simply be adding fuel to the fire. To tide the child over this period of a few hours, or perhaps a day, a sterilized barley water was prepared fresh every day and kept in the stores constantly. From a personal experience in several cases I found it very useful and strongly recommend it.

The relation of temperature and humidity to digestive troubles has been carefully studied, and a number of tables has been made, with as yet no positive results. The investigations will be further carried on and reported at another time. It is enough to say now that it has been proved that eighty-five per cent. of the children dying from digestive troubles live in tenements. Let us for a moment consider the conditions under which these children are reared, especially those brought up on the bottle. As a rule, whenever a child cries it is the signal for the mother to feed it, as she imagines the child is hungry, when it is crying because of a stomach ache; then the amount given at one feeding is often twice the amount that is necessary. As a result of these errors there is a catarrhal condition of the mucous membrane, and the child is in a condition to be unfavorably affected by any infected food. If the child is fed on milk, it has come in nine cases out of ten from the corner grocery, and the milk is from twenty-four to forty-eight hours old, and has been standing in the heated store exposed to contamination and dust of all kinds, and then the mother keeps it in an unclean vessel, and by the time the poor baby re-

ceives it the milk is swarming with germs, and instead of being a food acts as a poison, just as much so as arsenic or strychnine.

Another class of babies are partly nursed and fed from the table, and the most indigestible and harmful things are given to them.

Very few babies who are nursed from the breast entirely suffer from cholera infantum.

These causes are more potent in causing digestive troubles among children than the direct effect of heat and humidity. Indirectly, heat and humidity have a decided effect by influencing the milk supply. Heat and moisture favor the growth of bacteria, and milk is a most fertile culture medium.

There were no special reasons why the temperature and humidity should have affected the death-rate during the season of 1896 more than in other years.

If our reasoning was correct, the large number of children fed on dispensary milk in Yonkers should be productive of a decrease in the death-rate from digestive troubles. Let us see just what has occurred in Yonkers, from a study of the death statistics. The average number of deaths of children under five in the months of June, July, August, September, in the years 1892,1893,1894, and 1895, was 162. In the same period in 1896 the number was 135, a decrease of 27 deaths, or seventeen per cent. The average number of deaths for the four years from digestive troubles was 91, while in 1896 the number was only 48, a decrease of 43 deaths, or forty-seven per cent. The increase of population in Yonkers from 1880 to 1890 was seventy per cent., and there is every reason to believe that the same ratio has been maintained since 1890; for in 1890 and 1891 the average attendance in the public schools was 2,376, in 1895 and 1896 the average attendance was 3,476, an increase in five years of 1,100, or forty-six per cent. The other causes of death among children show an increase of 16, or thirty-seven per cent. The number of deaths among persons over five shows an increase of 26, or twenty-two per cent. These increased

Death Statistics for Months of June, July, August, and September.

Years.	HOBOKEN, N. J. POPULATION, 55,000.						LONG ISLAND CITY. POPULATION, 40,000.						NEWBURGH. POPULATION, 26,000.						YONKERS POPULATION, [illegible].					
	Total deaths.	Over five.	Under five.	Digestive troubles.	Marasmus.	Others.	Total deaths.	Over five.	Under five.	Digestive troubles.	Marasmus.	Others.	Total deaths.	Over five.	Under five.	Digestive troubles.	Marasmus.	Others.	Total deaths.	Over five.	Under five.	Digestive troubles.	Marasmus.	Others.
1892.....	501	224	277	107	63	107	360	152	208	89	38	103	193	122	71	35	14	18	302	124	178	113	24	41
1893.....	477	172	305	92	66	147	436	184	252	86	45	111	197	115	82	30	28	20	256	127	129	82	20	27
1894.....	444	151	293	117	54	122	353	134	219	87	40	92	177	110	67	23	28	16	303	119	184	98	33	54
1895.....	497	215	282	99	57	126	394	173	221	98	38	85	174	96	78	30	25	23	255	97	158	70	35	50
Average, 4 yrs.	480	191	289	104	60	126	386	158	225	90	40	99	185	111	75	30	24	19	279	117	162	91	28	43
1896.....	608	256	352	110	72	170	441	184	257	115	43	99	188	116	72	43	12	16	278	143	135	48	27	60
Present increase or *decrease*...	...	...	22	6	..	...	...	...	14	28	..	...	...	...	*4*	40	..	..	...	...	*17*	*47*	..	..

percentages would be somewhere near the increase of population in five years. This is a wonderful record for Yonkers—a saving of 43 lives in the short space of four months in a town of only 40,000 people.

I might add that there was no material change in either the hygienic conditions or the milk supply in Yonkers during the summer of 1896 from that of previous summers.

It would be inconclusive to judge of the result from the death-rate in Yonkers only, so the death statistics of the neighboring cities of Hoboken, Long Island City, and Newburgh have been tabulated. These cities were chosen for comparison because they would be similarly affected by any climatic influences, also because they are nearly of one size. Both Hoboken and Long Island City are slightly larger than Yonkers, and the location of Long Island City is not so good, and the proportion of people living in tenements is larger than in either Yonkers or Hoboken. The milk supply of all three cities comes from two sources—the one from the neighboring farms, the other by railroad from some distance. Very little of the milk supplied is but twelve hours old, and a large proportion thirty-six hours old, and some older. Newburgh is smaller than Yonkers, with a much smaller tenement population, and those living in the tenements are of a higher order of intelligence. The location of the town is excellent, with natural drainage toward the river. The milk supply is good, Newburgh being the largest town in a noted dairy county; the milk is brought in fresh twice a day in farmers' wagons. I have been told by a physician living there that the milk is only twelve hours old when it is delivered to the consumer. In none of these cities —Hoboken, Long Island City, or Newburgh—is there a pasteurized milk dispensary.

The following is a summary of the tabulation:

Hoboken.—The average number of deaths among children under five for the four summer months of the years 1892, 1893, 1894, and 1895 was 289. In the same period in 1896 the number reached 352, an in-

crease of twenty-two per cent. The number of children dying from digestive troubles averaged 104; in 1896 the number was 110, an increase of 6, or six per cent.

Long Island City for the same period shows an average of 225 deaths among children under five; in 1896 the number was 257, an increase of 32, or fourteen per cent. The deaths from digestive troubles averaged 90, while in 1896 they reached 115, an increase of 25, or twenty-eight per cent.

Newburgh for the same period shows an average of 75 deaths among children under five; in 1896 the number was 72, a decrease of 3, or four per cent. The deaths from digestive troubles averaged thirty; in 1896 they numbered 43, an increase of 13, or forty-three per cent.

In these three cities the average number of deaths among children was 589, while in 1896 the number was 681, an increase of 92 deaths, or fifteen per cent. The deaths from digestive troubles averaged 224; in 1896 the number reached was 268, an increase of 44 deaths, or twenty per cent. This increase of twenty per cent. is just about the normal augmentation caused by the growth of the cities, while in Yonkers, with a rapidly expanding population, there is a decrease of seventeen per cent. in deaths among children, and a decrease of forty-seven per cent. from digestive troubles among children; the other causes of death among children increased thirty-seven per cent. There is no need for further argument—these figures speak for themselves.

In conclusion, a summary of the evidence in regard to Yonkers shows:

1. That bottle-fed children under one year of age and living in tenements are by a vast majority the subjects of fatal digestive troubles in the summer months.

2. That temperature and humidity extremes exert but slight direct influence in causing digestive troubles, but indirectly, by favoring the growth of bacteria in the milk supply, a very great influence.

3. That pasteurized milk is not curative of itself,

if the child has been suffering from infection due to impure milk.

4. That pasteurized milk, if used intelligently as directed among a large number of healthy children, will reduce the mortality of a community to a marked extent, regardless of all adverse hygienic and climatic conditions.

5. That the extraordinary reduction of deaths from digestive troubles in Yonkers was not mere chance, but the direct result of well-conceived efforts in behalf of the children living in the tenements.

We do not take any credit to ourselves for having discovered anything new, but have merely put into practice certain well-known principles, with what measure of success you have learned. If the death-rate in Yonkers can be lowered by the adoption of these principles, it can be done in any other town, and in view of the good accomplished in Yonkers, I urge upon the profession generally the establishment of pasteurized milk laboratories in all centres of population, where the poor may obtain pure milk properly proportioned, and at a price within their means. To the physician it offers one of the surest and simplest means of keeping young children in good health during the summer months, and to the poor its advantages are so manifest that nothing need be said in its favor.

It is not maintained that pasteurized milk is a panacea for the digestive troubles of infants, but in a majority of cases it will carry them through the heated months and will be the means of saving countless lives.

The conditions existing to-day make the subject of infant feeding a most important one. The number of mothers who are either unable or unwilling to nurse their children is increasing; the growing tendency toward congestion of population, with its attendant evil, the overcrowded tenement house, the poverty and ignorance among the occupants of these houses, and the impure quality and over-quantity of food given the babies at irregular intervals; the distance milk is brought by the railroads, and its consequent agitation

	Age.	Date of death	Max. temp. on day of death.	Max. humidity on day of death.	Abode.	Diagnosis.	How long sick.	Remarks.
1	1 yr	June 9	78	95	Tenement	Enteritis.	4 days.	Breast-fed.
2	"	" 13	69	89	"	Acute indigestion.	5 "	Bottle fed. Milk. Was seen by physician in moribund condition six hours previous to death.
3	"	" 21	85	92	"	Gastro-enteritis.	6 "	Breast-fed.
4	"	" 22	87	87	"	Cholera infantum.	1 day	Bottle-fed. Milk.
5	"	" 22	87	87	"	Gastro-enteritis.	3 days	Bottle fed. Milk until taken sick, then sterilized milk.
6	"	" 25	63	100	"	Gastritis.	4 "	Breast-fed.
7	"	" 26	77	100	"	Cholera infantum.	4 "	Bottle-fed. Milk. Child neglected by parents.
8	"	" 27	79	60	"	Acute enteritis.	5 "	Bottle fed. Milk and from table.
9	"	July 3	84	98	"	Acute gastro-enteriti-.	4 "	Breast-fed.
10	"	" 5	81	95	"	Enteritis.	3 "	Milk and from table. Moribund when seen by physician.
11	"	" 5	81	95	"	Cholera infantum.	5 "	Breast-fed until taken sick, then sterilized milk for two or three days.
12	"	" 6	78	95	"	Cholera infantum.	3 "	Breast-fed and condensed milk until taken sick, then sterilized milk.
13	"	" 9	76	100	"	Cholera infantum.	5 "	Artificially fed. Milk.
14	"	" 11	86	93	"	Cholera infantum.	3 "	Bottle-fed. Goat's milk.
15	"	" 13	87	79	"	Acute gastro-enteritis.	7 "	Bottle-fed. Condensed milk.
16	"	" 14	85	86	"	Gastro-enteritis.	6 "	Bottle-fed. Milk and from table.
17	"	" 14	85	86	"	Cholera infantum.	3 "	Breast-fed.
18	"	" 14	85	86	"	Gastro-enteritis.	10 "	Bottle-fed. Milk.
19	"	" 14	85	86	"	Cholera infantum.	3 "	Breast-fed.
20	"	" 14	85	86	"	Cholera infantum.	2 mos.	Bottle-fed. Malted milk until child was much worse, then sterilized milk.
21	"	" 14	85	86	"	Gastro enteritis.	2 days.	Bottle-fed. Milk. Neglected by parents.
22	"	" 14	85	86	"	Enteritis convulsion.	5 "	Breast-fed.
23	"	" 15	83	99	"	Cholera infantum.	5 "	Bottle-fed. Milk.

24	$1\frac{5}{12}$	"	"	16	77	86	"	Cholera infantum.	1 day.	Bottle-fed.	Milk. "Marasmus."
25	$1\frac{5}{12}$	"	"	17	75	76	"	Gastro-enteritis.	5 days.	Bottle-fed.	Sterilized milk for two or three days.
26	$1\frac{6}{12}$	"	"	17	75	76	"	Acute gastro-enteritis.	3 "	Bottle-fed.	Condensed milk.
27	$1\frac{7}{12}$	"	"	17	75	76	"	Summer complaint.	4 wks.	Bottle fed.	Milk and from table.
28	$1\frac{5}{12}$	"	"	19	73	90	"	Acute gastro enteritis.	2 days.	Bottle-fed.	Milk.
29	$1\frac{2}{12}$	"	"	20	82	92	"	Cholera infantum.	8 "	Bottle-fed.	Condensed milk. Baby came from New York city in moribund condition.
30	$1\frac{1}{12}$	"	"	25	76	84	Flat.	Acute gastro-enteritis.	2 "	Breast-fed.	
31	$1\frac{8}{12}$	"	"	28	89	93	Tenement.	Cholera infantum.	7 "	Bottle-fed.	Milk and from table.
32	$1\frac{6}{12}$	"	"	30	88	87	"	Gastro-enteritis.	6 "	Bottle fed.	Milk.
33	$1\frac{2}{12}$	"	"	31	78	72	Residence.	Diarrhœa.	2 mos.	Bottle-fed.	This was an eight-months child, and was fed on malted milk, then on pasteurized milk. Death was from meningitis.
34	$\frac{8}{12}$	"	Aug.	1	71	83	Tenement.	Cholera infantum.	8 days.	Bottle-fed.	Milk and from table.
35	$1\frac{2}{12}$	"	"	2	80	93	"	Cholera infantum.	2 wks.	Bottle-fed.	Milk.
36	$1\frac{3}{12}$	"	"	5	89	80	"	Cholera infantum.	5 days.	Bottle fed.	Condensed milk.
37	$1\frac{4}{12}$	"	"	5	89	80	"	Chronic diarrhœa.	3 "	Bottle-fed.	Cow's milk. Pasteurized milk when taken sick.
38	$1\frac{3}{12}$	"	"	5	89	80	"	Cholera infantum.	2 wks.	Bottle-fed.	Milk.
39	$1\frac{3}{12}$	"	"	7	91	93	"	Cholera infantum	5 days.	Breast-fed.	
40	2	"	"	18	73	93	"	Cholera infantum.	5 "	Bottle-fed.	Milk and from table. Moribund when seen by physician.
41	$1\frac{3}{12}$	"	Sept.	7	74	75	"	Gastro-enteritis.	14 "	Bottle-fed.	Malted milk. Pasteurized milk. Was doing well. Four weeks later physician was called, and he does not know the kind of food child had in the interval.
42	$1\frac{1}{12}$	"	"	10	86	73	"	Gastro-enteritis.	2 "	Breast-fed.	
43	$1\frac{1}{12}$	"	"	10	86	73	"	Gastro-enteritis.	1 day.	Breast-fed.	
44	$1\frac{11}{12}$	"	"	10	86	73	"	Gastro-enteritis.	4 days.	Bottle-fed.	Milk.
45	$1\frac{2}{12}$	"	"	12	78	90	"	Meningitis, diarrhœa.	2 wks.	Bottle-fed.	Pasteurized milk for a while, then condensed milk.
46	$1\frac{3}{12}$	"	"	16	74	78	Flat.	Gastro-enteritis.	8 days.	Breast-fed.	
47	$1\frac{10}{12}$	"	"	21	65	83	Tenement.	Enteritis.	14 "	Bottle-fed.	Milk. "Marasmus."
48	$1\frac{3}{12}$	"	"	30	72	82	"	Cholera infantum.	6 "	Bottle-fed.	Condensed milk.

added to the time required in transit, all aid in the growth of bacteria. Knowing all this, it is astonishing that there are not more deaths among the tenement children. Yet most of these deaths can be prevented.

To those who may be thinking of establishing a laboratory, some figures showing the cost of the plant and the operating expenses will be of interest.

Estimated cost of plant for pasteurizing 1,200 bottles daily, $1,000. The actual net deficiencies have been: 1894, $704; 1895, $1,034; 1896, $1,025.

Any details in regard to plant and methods employed will be cheerfully given, and a cordial invitation is extended to those interested to inspect the plant.

In closing, I desire to state that this work in Yonkers has been made possible through the action of one man, who has not only given his time and thought from a busy career, but has also given the plant and has paid all the expenses of its operation. Would that there were more men like him.

Dr. Joseph E. Winters congratulated the reader of the paper, not only upon the results obtained, but upon the very clear manner in which the matter had been presented. He said that his experience had impressed him with the fact that it was impossible to keep milk and barley water that had been mixed, and sterilized or pasteurized, for any considerable time without undergoing some change. He was inclined to think that the reason why many of the children fed on the milk from the Straus depots had had digestive troubles was that the milk had been mixed with barley water—at any rate, by simply directing the discontinuance of this mixture, and giving simple directions regarding the feeding, the digestive trouble had disappeared. He thought that it was a mistake to mix milk and barley water at the laboratory, on account of the proneness of such a mixture to undergo fermentation in hot weather. No mention had been made this evening regarding the method pursued for detecting a diseased condition of the udders of the cows—a very important matter. It was well known that cows suffered from scarlatina as do human beings, and that the principal source of scarlet fever, when originating in the milk supply, was from the cows themselves. This source

of scarlatina should be eliminated by having the dairies and animals inspected, not by veterinarians, but by competent medical men. It was also important that the water supply used both for watering the cattle and for washing the milk bottles and other utensils should be carefully examined and its purity guaranteed. Regarding pasteurization, the speaker said that it was now known that bacteria were destroyed by a temperature of 148°, or a little over, and that, therefore, there was no necessity for raising the milk to 212° F., and so impairing its nutritious properties. This observation, he believed, had first been made by Professor Leeds, of Hoboken. So-called pasteurization at home in private practice was usually nothing more than sterilization. It was not probable that after the cream had been separated from the milk by centrifugal force it could be again mixed with milk, and produce a milk of the same quality as before. In some parts of England the milk was placed in a glass receptacle with a tap at the bottom, so that the portion of the milk containing a good deal of casein could be drawn off, leaving the upper part rich in cream and poor in casein. Such a milk could be modified so as to approximate human milk very readily. Another question to be considered in this connection was the fact that the success obtained by Dr. Getty and others in this field was likely to lead mothers to abstain from nursing their babies. Nothing could take the place of good breast milk, and hence physicians should embrace every opportunity to insist upon mothers nursing their infants whenever this was possible. A woman who was not willing to nurse her baby when she had a sufficient supply of milk was not a fit woman to be a mother. It was a very common thing now for women to talk over the matter of artificial feeding long before the birth of the baby.

Dr. Rowland G. Freeman said that after listening to a paper like the one just read it was hard to believe that there was nothing actually curative in pasteurized milk. Some of the sick children had been brought down to the Straus milk depots at the docks, and there the combined action of clean food and fresh air, without any medicine, had, in many instances, accomplished more than all the previous medical treatment. Where such a milk was widely distributed it should have a marked effect on the death-rate. The Straus milk depots were first started in the summer of 1893, but during this first season only a small quantity of milk was distributed.

Omitting this year, therefore, from the statistics, and considering only the months of July and August (these being the only months in which much pasteurized milk was distributed) in the three previous and the three following years, it certainly seemed as though the pasteurized milk had helped to lower the death-rate. Thus, while there had been an increase in the total death-rate during the last three years of 2,330, there had been an actual diminution of the deaths in children under five years of age of 370. Again, the deaths from diarrhœal diseases, instead of increasing as they should have done, had been reduced by 860.

He did not think the trouble with the barley water was likely to be due to bacterial growth, as in the Straus laboratories the barley water was subjected to the same high temperature as the milk. The trouble was more likely something inherent in the barley itself. It was very easy to pasteurize milk at home. When this was done, it was safe to pasteurize the milk at a temperature lower than 167° F. A temperature of 134.4° F. for thirty minutes was not enough to change the taste of the milk, but was ample to destroy the typhoid and tubercle bacilli. A temperature of 134.4° F. for half an hour seemed to be desirable.

Dr. W. H. Sherman, of Yonkers, said that he was one of the physicians in Yonkers who had had an opportunity of watching the results of the use of this milk in practice. This experiment with milk had been carried on under very favorable circumstances, for, owing to the smallness of the city of Yonkers, Dr. Getty had been able to reach a much larger proportion of the population than would have been possible in larger cities. For the same reason, he had been able to get at the results and the causes of death more exactly than would have been possible in a larger city. We were all aware of the many inaccuracies in death certificates. In the comparison of the cities given in the paper the selection seemed to him very fortunate. These three cities were sufficiently near together to be affected by any changes of climate. If there were any advantage it would be in the case of Newburg, which was situated in a much more mountainous country, where the humidity was less than in the other places. Notwithstanding this fact, the death-rate in Yonkers had been reduced to a point less than that in Newburg.

In Yonkers pure milk had been dispensed to the people at a price less than that for which ordinary milk

could be bought at the stores. It had also been dispensed in a form which made it easier, as well as cheaper, for the people to use it for the children. These were important factors in securing the establishment of the milk dispensary. The people had now been sufficiently educated to appreciate its advantages, and already the mothers were aware of the fact that children fed with this milk were not so sickly as other children. Among the children in his practice who had been fed on this milk last summer not one had had cholera infantum. It was important to remember that not a single death had occurred among the children in Yonkers who had been fed on this milk regularly from a time prior to taking sick. It seemed to him that it was a fair question to raise, as to whether the good results had been due to the unusually good quality of the milk or to its pasteurization. When one considered the harsh treatment which the milk often received—as, for instance, the placing of the whole day's supply of milk around the child in a baby carriage—it certainly seemed that the pasteurization was necessary and important. The practice had been to pasteurize the milk by an exposure of thirty minutes to a temperature of 167° F. It seemed to him that it would be a serious mistake to reduce the temperature at which the milk was pasteurized, for even now the milk could not be depended upon for more than twenty-four hours. He would be in favor even of a higher point for pasteurization. He had had a number of cases in which the barley water and milk, prepared at home, had not agreed with the children, yet all this trouble had disappeared as soon as the milk prepared at the milk dispensary with the barley water had been substituted. He had observed this even in wealthy families.

Dr. W. J. Chandler, of South Orange, asked what the reader of the paper understood by the term "modified milk." He thought, with Dr. Winters, that the addition of the barley water to the milk very greatly impaired its keeping qualities; he had found that in such a mixture the spores would develop within twenty-four hours, and for this reason he had been compelled to recommend that the barley water be made up twice in twenty-four hours. He also wished to ask whether the reader of the paper had implied that infants should be taken from the mother's breast and fed on pasteurized milk. In his opinion such a practice would be very reprehensible, and he would most heartily indorse the remarks

made by Dr. Winters regarding the nursing of infants. In the Oranges they had probably the best dairy in the country. It was strictly supervised by a veterinarian, by a medical commission, and by Professor Leeds. The latter reported upon the quality of the milk twice a month. The price of the milk was rather high, but its excellent quality counterbalanced this objection. It was proposed this season to have the cows themselves placed in a sterile room, and there milked. It was also the practice there never to feed the cows before milking, because the scattering of hay about the stable raised a dust.

Dr. Winters said that he had not spoken disparagingly of dispensary milk, or said that the milk could not be properly pasteurized at home, but he had objected to giving a mixture of milk with a cereal to an infant under a year of age. No matter how sterile it was, it was wrong to add the cereal to the food for such a young infant. He did not believe it was possible for barley water to remain sterile for more than a few hours; it was certainly a dangerous food.

Dr. Getty said that all the drinking water supplied to the cows had been carefully analyzed. At first they had experienced a little difficulty with the barley water, but now they used a barley flour, which was mixed up very thoroughly and boiled for two or three hours. It was mixed with the milk the same day and pasteurized. Last year some of this mixture had been returned daily, and none of it had shown any signof fermentation. The same could be said of the plain barley water which had been dispensed daily. Regarding the effect of the centrifugal machine on the character of the emulsion of fat in the cream, he said that a series of examinations had been made,and no difference had been detected between the centrifugal cream and the gravity cream as regards the fineness of the emulsion. By "modified milk" in Yonkers was meant equal parts of milk and distilled water, with a little limewater added to it to make it neutral or alkaline. Sugar of milk was also added to make the percentage six. For the wealthy patients a regular modified milk was prepared. He certainly was not in favor of taking an infant from the breast and putting it on the dispensary milk. About twenty-five per cent. of the women could not regularly nurse their infants, largely owing to the fact that the mothers must go out to work during the day.

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